APRIL, 1941 HNO_3 Vol. 30, No. 4

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INDUSTRIAL ARTS and VOCATIONAL EDUCATION

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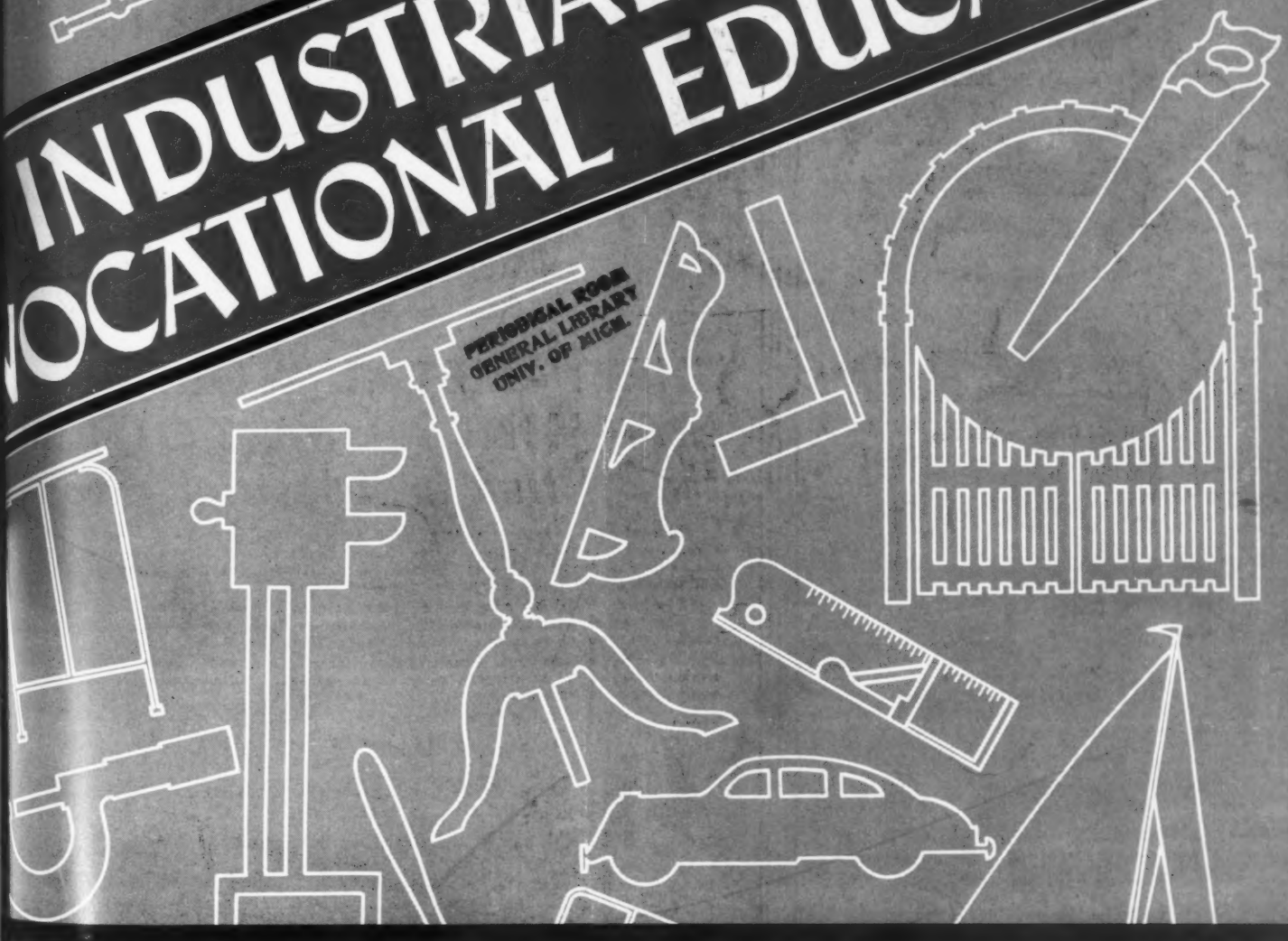

In This Issue: **The School That Boys Built**

By Walter E. Durbahn

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INDUSTRIAL ARTS *and* VOCATIONAL EDUCATION

VOL. 30 APRIL, 1941 Number 4

A REAL UNDERTAKING

The readers of INDUSTRIAL ARTS AND VOCATIONAL EDUCATION will, no doubt, get a great deal of inspiration from a number of articles appearing in this issue. Probably no article will impress them more, however, than the one entitled, "The School That Boys Built." Mr. Durbahn in this write-up gives an excellent account of how the need for Sandwick Hall suggested an unusual project for him and his students.

By word and picture he shows how the work progressed until at last an exceedingly presentable school building could be turned over to the board of education and to the high school students of Highland Park, Ill.

Mr. Durbahn deserves great commendation for having the courage to attempt such a large task. Both he and his students are to be congratulated for the fine piece of work which they produced.

COMING CONVENTIONS

WESTERN ARTS ASSOCIATION, Stevens Hotel, Chicago, Ill. March 20, 21, and 22.

ILLINOIS VOCATIONAL ASSOCIATION, Rockford, Ill., March 27–29.

NEW JERSEY VOCATIONAL AND ARTS ASSOCIATION, Asbury Park, N. J., March 27–29.

INDIANA INDUSTRIAL ASSOCIATION, W. Lafayette, Ind., March 28 and 29.

NEBRASKA INDUSTRIAL ARTS TEACHERS ASSOCIATION, Lincoln, Neb., March 28 and 29.

EASTERN ARTS ASSOCIATION, Pennsylvania Hotel, New York City, April 16–19.

KENTUCKY STATE INDUSTRIAL ARTS ASSOCIATION, Louisville, Ky., April 18.

CALIFORNIA INDUSTRIAL EDUCATION ASSOCIATION, Fresno, Calif., April 19.

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Sugar Pine grows chiefly in the Sierra Nevada* of California. Scattered tracts are also found in southern Oregon. The tree grows in small, irregular groups on glacial moraines at elevations from 3,000 to 7,000 feet. Fairly rapid in growth.

In beauty of form, the sugar pine has few equals among timber trees. It is a large, tall tree often attaining a height of 200 feet and a diameter up to 7 feet. The top is sparse and rather flattened.

The bark is deeply furrowed, and broken into "turtle back" plates. It varies in color from rich purple to cinnamon brown. The leaves (needles) grow in clusters of five and are 2 to 4 inches long. Cones few, pendulous, carried on tips of branches, slender, 12 to 24 inches long.

To date, twenty-four brief articles similar to the one above and dealing with the more commonly used woods have appeared in these ads. As in the past, we continue to invite your suggestions as to the species of wood you would like featured in this series.

YATES-AMERICAN

INDUSTRIAL ARTS *and* VOCATIONAL EDUCATION

Contribution of Industrial Arts to a Functional Education*

EARL L. BEDELL[1]

Psychology defines a concept as a mental picture. If the word *horse* is mentioned, the concept formed in most people is very largely identical. Some may recall a black horse, others a sorrel or a gray or a spotted horse, but, in the main, most will have the same concept or mental picture; in other words, there is no diversity of mind picture in a word as simple as *horse* or *dog*. But there are other words that arouse a great diversity of mental pictures or concepts. It would be surprising to know what is the concept in, let us say 20 different persons, of a word like *democracy*.

Considerable confusion has resulted because of differences in fundamental concepts concerning the industrial arts in the scheme of American education. There have been a large number of interpreters; therefore, there have been as many different concepts as there have been those who have tried to make the interpretations. Back in 1937 a committee was appointed by the Commissioner of the United States Office of Education for the purpose of formulating a statement concerning "Industrial Arts — Its Interpretation in American Schools." This statement has done much toward developing a common concept among teachers and laymen everywhere. The following, rather extensive quotation is taken from this bulletin; "Industrial Arts — Its Interpretation in American Schools," Bulletin 1937, No. 34.

The primary duty of our public schools is to provide educational training for citizenship in a democracy. Among the important responsibilities of citizenship is that of participation in the work of the community. Every good citizen is a worker and a producer, whether in commerce, professional pursuits, public service, transportation, agriculture, manufacturing, or other occupational fields. He is also an appreciative consumer who is affected by the intricate interdependence of all occupations. Industrial arts, parallel with other subjects and curriculums and correlated with them, contributes to the realization of the goal of enlightened citizenship.

This is essentially an industrial age; modern civilization is dependent largely upon science, invention, and skill. The manufacturing industries are important among the activities which make for the material well-being of the people. They should be exemplified in the facilities provided by public education. The general education of every public school pupil — his cultural development — is incomplete without concepts, understandings, and appreciations regarding manufacturing and its hosts of workers. Industrial arts as an educational field makes this desired contribution to the pupil's development. It concerns itself with the aesthetic and economic values of materials, with basic processes of manufacture, and with many problems of the workers.

The public schools, through the grades, should be rich in provisions for pupil experiences (1) which teach the necessity and dignity of work; (2) which illustrate the diversification of industry; (3) which provide for testing personal interests and aptitudes in representative crafts; (4) which serve avocational interests in construction; (5) which develop consumer knowledges and appreciations; (6) which provide occupational training for those who plan to enter employment as industrial workers and for those now in manufacturing trades who desire to improve their proficiency. The first five of these points are served by industrial arts as a phase of the general education desirable for all; the sixth point is the function of industrial or trade education for those who need it as specific training. Industrial arts merges into trade preparation at the time when general education objectives change to specific training objectives.

Industrial arts is a phase of general education that concerns itself with the materials, processes, and products of manufacture, and with the contribution of those engaged in industry. The learnings come through the pupil's experiences with tools and materials and through his study of resultant conditions of life. It is a curriculum area rather than a subject or course, being comparable in this respect to the language arts.

Industrial arts, therefore, has general values that apply to all levels, and in continuous program these values are progressively intensive and are cumulative in their effect as the pupil advances in maturity. Through such a program the pupil:

1. *Gains knowledge* of the changes made in materials to meet the needs of society, of tools and industrial processes used to effect these changes, of the constant adaptation of materials, tools, and processes to meet changing needs and conditions, and of industrial workers and working conditions.

2. *Grows in appreciation* of the value of information regarding occupations as a background for a wise choice of a career, of the importance in modern life of tools and industrial processes, of the artistry of the designer and the skill of the artisan, and of the dignity of productive labor.

3. *Increases in ability* to plan constructive projects, to select and use sources of industrial and related information, to handle tools and materials, to express with material things his individual interests, to use effectively his recreational time, to work and share as a member of the group, and to evaluate work and its products.

4. *Develops attitudes* of concern for safety practices, of consideration for workers in all fields, of regard for cooperation among the members of a group, and of respect for property.

Largely manipulative in character, yet affording content of an informative, technical, and social kind, industrial arts contributes to complete living because it meets needs that are real and satisfies impulses that are inherent. It contributes in a unique and wholesome way to social awareness and morale. Reading, discussion, observation, and experiment are combined with participation in activities which permit discovery and development of creative and artistic abilities. The articles selected for hand or machine and the topics chosen for study vary in complexity with the ages, interests, and needs of pupils. The work is appropriate for boys and girls alike, and extends into the realm of adult education. Outside the schools, industrial-arts subjects or activities are pursued for avocational and recreational or for occupational values, as individuals or groups may determine. In school and out, regardless of ages and interests, industrial arts makes a unique contribution to intellectual development, to social orientation, and to economic adjustment. Those who have deep appreciation of its

*Address given before the Wisconsin Industrial Arts Association, Milwaukee, Wis., on Thursday, Nov. 7, 1940.
[1]Director of Vocational Education, Detroit, Mich.

worth to individuals and to society must be students of its origins and compulsions, its universality and permanence, its outlets and satisfactions.

The industrial arts exert a strong influence over people everywhere. In fact, we come to associate people with some of their industrial arts.

For example, the Javenese are known for their batiks; the Chinese for their cloisonné, embroideries, carvings, and thick pile rugs; the Mayans for their clever and meticulous craftsmanship expressed in such forms as basketry and articles of jade and gold; the Japanese for their ceremonial swords, Satsuma, and colored block prints; the Greeks for their classical architecture; the Bokharans for their Turkoman rugs; and the Americans, among other things, for their great industries, skyscrapers, and transportation facilities, all resulting from the development of machines and power.

Our social and economic status can be interpreted best through an understanding of the industrial arts in any given area.

The persons of a generation or two ago in rural New England witnessed economic and living conditions little different from those of an Italian community in the time of the Roman Empire, more than a thousand years before. Both communities used hand tools and practiced the household industries; power-driven machinery was unknown. Except for a few canals, the only means of transportation was by animal power, oxen or horses. Transportation costs were such that trade was mainly local and in handmade products. The entire economic system was open to view and free from mystery. The difference between those conditions and the complexities of modern business and industry accounts for many of the problems of maladjustment and misunderstanding that now agitate society. The elements and the principles of social and economic life are the same today as then, but the relations existing between them have become obscured by their very complexity. Points such as these indicate a phase of life which industrial arts and its related social and physical sciences need to interpret. Experiences provided through industrial arts are important for a sound understanding, on the part of the pupil, of the social-economic forces and conditions operating in society.

The purpose of quoting at some length from this bulletin is to encourage its use in interpreting the function of industrial arts in American education. There has been a real need for a basic and common understanding concerning the fundamental concepts of industrial arts. This article deals with the contribution of industrial arts to a functional education in terms of these basic concepts.

A mechanical device is functional when it operates to perform some desired work or operation. Those of you who were fortunate enough to be born on a farm are perfectly familiar with the function of a corn sheller. It is used to shell corn; there is no question about it. Its function is obvious and the builder of that machine had this specific function in mind. It is interesting to note, though, that many mechanical devices can be made to perform other functions.

As a boy, the writer disliked very much the job of shucking black walnuts. There were several of these black walnut trees and when the frost came and the walnuts within pithy husks fell on the ground, he had to pick them up, put them in a pile, and then later remove the outer husk. As most of our readers know, the pithy husks stain the hands and the writer was somewhat concerned about that. He soon learned, however, that walnuts could be fed through the corn sheller which would successfully remove the husk. Thus, the machine performed another function.

The function of industrial arts is not a single one. It has been used in various situations to perform many educational functions. Perhaps one of the primary concepts should be that it can perform many functions.

It cannot be taken for granted that industrial arts is functional in our American system of democratic education without first observing just what functions it may perform. In just the same way that the mechanical genius of James Watt was necessary to make steam functional, so it is equally necessary that the organizing ability of our public school administrators shall be definitely directed toward making industrial arts perform in a functional way. Industrial arts must be correctly applied to an educational plan.

An inventory of the activities carried out in industrial-arts shops of this country will show that the large number of variations in industrial-arts programs has been an important factor in popularizing industrial arts in our schools.

Among the numerous examples of the use of industrial arts are the variations for the slow-learning group in our high school. Perhaps the time has come when we should consider as a very important problem the arranging for variations in our industrial-arts program to meet special needs. The traditional industrial-arts program has been largely confined to a shop period. Administrators have provided an elective in industrial arts. There is a time allocation and the youngsters go to the industrial-arts shop one hour or two a day, once or twice a week. We have expected much good to accrue from that sort of use of industrial arts in education.

The quotation taken from the bulletin, "Industrial Arts — Its Interpretation in American Education," was placed into this article in order that we, the teachers, may get a concept of what industrial arts may contribute, but it is especially important that our school administrators also get this concept.

In our secondary schools today there are a large number of slow-learning, non-academic pupils. The administrators see in the industrial-arts program an opportunity to serve these youngsters and so they send them down to the shop for two hours a day. Doing just that much will not obtain the desired results. There must be variations in the whole school program to the end that industrial arts may become an accepted part of a complete program of education.

Industrial arts is a subject-matter area and is perfectly adaptable to any intelligence level. If the school administrator sees in the industrial-arts program the opportunity to assist materially in the education of a certain group of boys and girls in his high school, we should accept that as a challenge. We have been accepted in the circles of general education and should share in interpreting the contribution of industrial arts to the general or basic education of boys and girls.

Is it not fair, is it not reasonable, then, to expect the school administrator to make certain variations not only in the industrial-arts part of the program but in the mathematics, in the English, in the social studies, and in the science. Those of you who have worked in curriculum groups in relation with other departments of your school know that part of our difficulty has been our inability to adjust the other subject areas to make them functional.

If we may accept some estimates, there are some 50 or 60 per cent of our students in the comprehensive high school that are maladjusted to the present curriculum. There is a group of about 40 per cent of our high school boys and girls that is getting along very well in certain established curriculums such as the college-preparatory curriculum. But we know that 60 per cent are not getting along so well.

Now, if we create the impression which we do not care to do — that industrial arts is a sort of panacea or cure-all for all the ills of the secondary school program, we are only going to bring ourselves into disrepute. But, if we can get the secondary school administrator to go along with us on the proposition that industrial arts contributes a great deal to the education of this mass of youngsters, if the industrial-arts program will assist 20 or 30 per cent of these youngsters, we are doing our part; we are making a contribution.

A baker making a cake uses flour, sugar, eggs, and other ingredients. These ingredients have to be put into the cake in very accurate proportions. If any are omitted or included in the wrong proportions, the cake will be a failure. I like to think of the contribution of industrial arts as being one of the ingredients of education, and it is our business to get this ingredient into education in just the right proportion.

We know, for example, that the general shop idea is good and reaches far beyond the teaching of manipulative skills. We know that the pupil personnel operation of a school shop in which children participate in an organization to the end that they can all work more effectively is democracy in practice. We know that the idea of our job sheets and our job analysis is basically sound.

Knowing these things as we do, we can stand assured that we have a good ingredient in education. We are contributing something worth while and we should spend our time organizing our contribution to meet the needs of more and more children. Industrial arts has come out of the basement; it has become a recognized

part of the curriculum. But there still is a lack of common understanding or concept as to just what contribution it is going to make.

In Detroit there is a different organization for vocational education than there is in Wisconsin. The Michigan objectives are the same as those in Wisconsin, but the organization is carried on without the differentiations of administration. In the Detroit high schools we have taken the concept that was expressed in the bulletin — that industrial arts is to become increasingly more intensive. Therefore, for a large number of boys in the shops of Detroit high schools — the machine shop, the pattern shop, and other shops — an intensity is taken on that contributes directly to vocational values. That is our interpretation of having industrial arts become more and more intensive, and it may be predicted that out of our present demand (the National Defense Training Program) there is going to be a new emphasis placed upon industrial arts because in the face of a national emergency we are turning to industrial training.

This does not mean that vocational education for National Defense is an industrial-arts program, but the operation of tools and the use of materials is, after all, a foundation that could have been laid very well during the past decade if an intensive vocational foundation had been laid in industrial arts.

It all suggests that perhaps we should spend a great deal of time on these variations in industrial arts. There is a committee at work now that is going to try to express in terms of our needs the opportunities for variation in our industrial-arts program.

If we can only get the general concept set up that industrial arts is a contribution only when it fits in with the whole scheme of things, we have accomplished something. An hour or two in the industrial-arts shop is not going to change the attitude of the boy toward education if he has to spend the rest of the school day in the traditional type of mathematics and science and social studies.

The day is coming when our comprehensive high schools will so adapt themselves that all of our boys and girls will come out with some kind of vocational skill. Our secondary schools will have to give some attention to encouraging our young people to learn in high school some operative skill. This may be a dangerous statement to make because, after all, the employment situation is such, generally, that employment does not begin until after the high school period. On the other hand, most of the young people will remain in high school until they have reached the age of 18 because that seems to be the minimum employment age. In time then, industrial arts will provide the opportunity for a progressively intensive program, moving toward the real vocational education which can be obtained on the job in some good apprenticeship program.

In conclusion, the writer believes that so far as the future of industrial arts is concerned, we have come to the time when variations must be set up, both in industrial arts and in the related subjects, to the end that the whole shall contribute to the education of the child.

The School That Boys Built

WALTER E. DURBAHN*

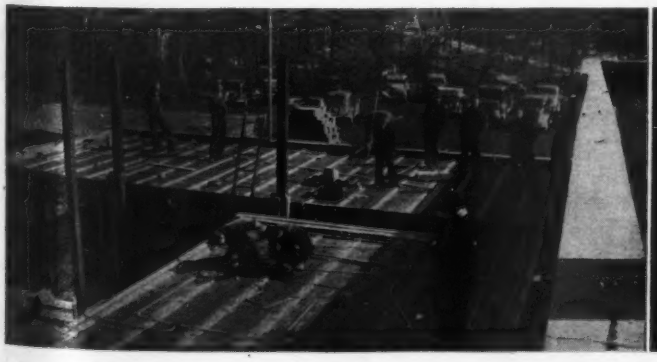
In 1925 the Highland Park High School broadened the scope of its curriculum by adding a vocational building trades course. Five years later a vocational auto mechanics and a general metals course were introduced. Since their aim was a general rather than specific trade training, the program came under the Smith-Hughes classification of general industrial trades training.

The students' time is divided into two units, three hours for trades work and three for academic work. Rather than have the students participate in the regular academic program of the school, separate classes were organized with the expressed purpose of relating the content of class instruction with the trade work. The related courses consist of English, social science, mathematics, science, and drawing.

Up to 1937 the building trades classes at Highland Park had been erecting a house or building each year for 13 years. During this time a small portable shop and the building under construction had to be shop and classroom for the practical work. This plan failed to provide facilities for what is now considered desirable procedure; it also failed to cope with unfavorable weather conditions.

A function of the secondary school is to provide exploratory experiences. In the erection of a building a student meets practical problems. Unfortunately, however, it does not give every student interested in building trades opportunity to try out the nature of each trade represented on such a construction job. Carpentry and concrete work constitute the major portion of a building; while such activities as electric work, plumbing, sheet-metal work, plastering, and brickwork each require only a few workmen. The able will get the direct experience in these latter trades, while the others will only observe. Then, too, on a construction job there is not sufficient time for fundamental tool instruction so essential in the laying of a good trade foundation. A permanent building would provide room for this instruction, a place for display of materials, and a convenient place for giving trade information.

*Highland Park High School, Highland Park, Ill.



After the precast joints were set and the forms for the concrete floor laid, the student electricians placed the electrical conduit for the light and power circuits

Pouring the concrete floor for mezzanine of the building trades shop

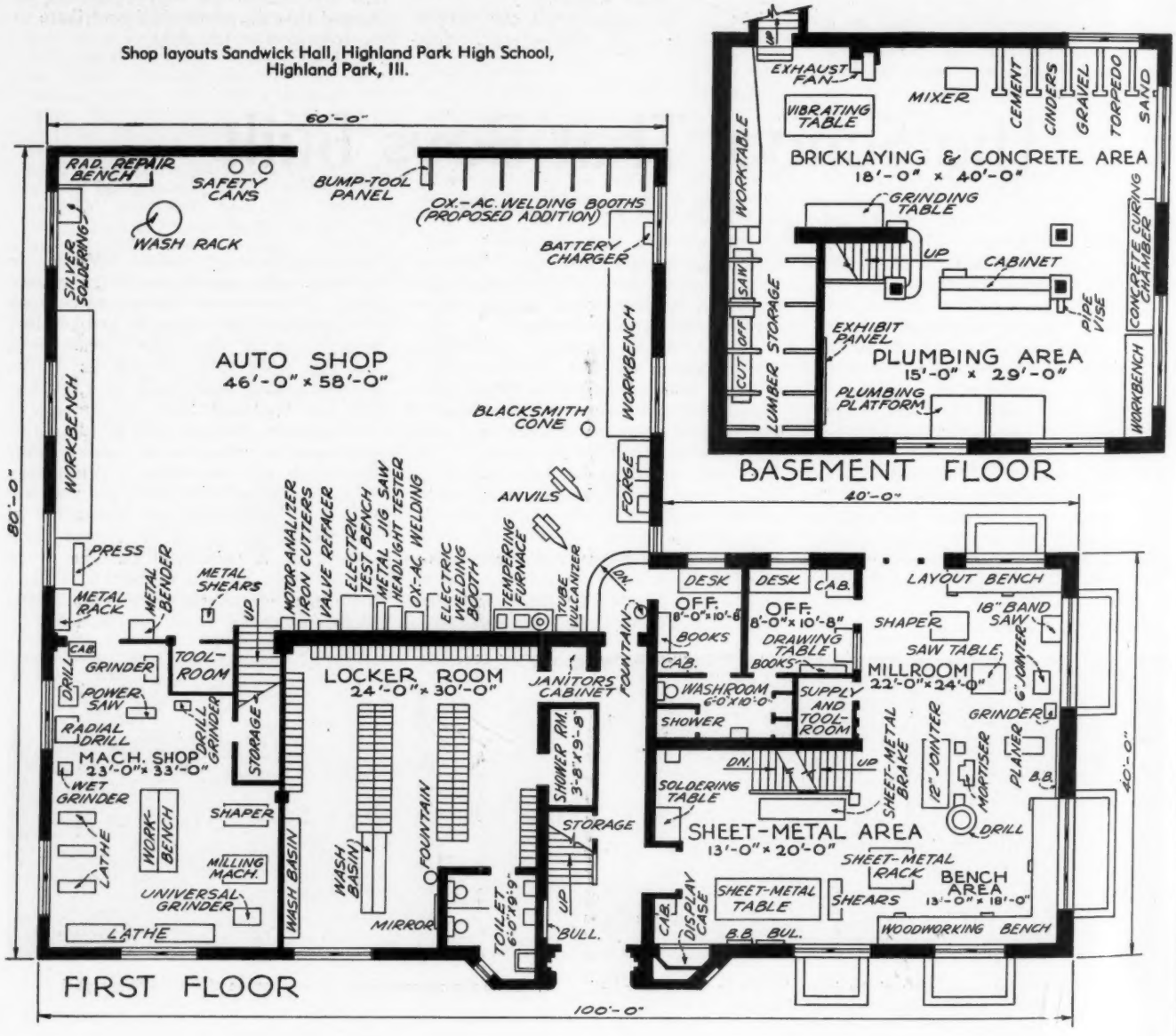
The Physical Setting for an Integrated Program

Sandwick Hall, the new vocational building, provides these indispensable shop facilities for the building trades. The building was dedicated to Richard Lanning Sandwick, principal and superintendent of this school from 1903 to 1938 and now acting in the capacity of adviser to the board of education. His philosophy of education was such that he deemed it advisable to institute vocational training in this residential community in 1925. The original plans for this shop, however, were gradually modified until all the trades and related work offered were consolidated under one roof, thus giving a physical setting conducive to an integrated program. In addition to this trade and related work, two industrial-arts metal classes are also conducted in this building; another building provides accommodations for the remainder of the industrial-arts and drawing classes of the school.

The school has an enrollment of 1300 students, and records show that 45 per cent of last year's graduates are attending higher institutions of learning. Of the 683 boys enrolled, 242, or 35 per cent, are in industrial-arts and drawing classes, and 72, or 11 per cent, are enrolled in the three trades classes, two of which are devoted to the building trades, and one to auto mechanics and general metal. The pupil demand for trades work is increasing and at present a number of applicants are on the waiting list. A selective system is being instituted to encourage only those with trade ability and interest to enroll. No doubt other trade classes will be organized when the need arises as the building is designed to accommodate a 66 per cent increase in enrollment.

Sandwick Hall is a 40 by 40-ft. addition to the original auto shop erected by the students in 1929. The east 32 ft. of the auto shop was remodeled into a locker room, washroom, and machine shop. A second story was added for related classrooms, thus creating a new and remodeled building of about 135,000 cu. ft. The entire structure is of reinforced concrete and masonry except the roof, which is of wood construction. The first, second, and mezzanine floors have precast concrete joists with a 3-in. reinforced monolithic concrete floor; all stairs are reinforced concrete. The inside walls on the first floor are of 5 by 12-in. buff color tile. This produces an attractively finished wall surface with low maintenance cost. The second story walls and ceiling are finished with silica sand plaster, tinted to a buff color, which gives a soft and pleasing appearance and will require no painting for many years.

Shop layouts Sandwick Hall, Highland Park High School, Highland Park, Ill.



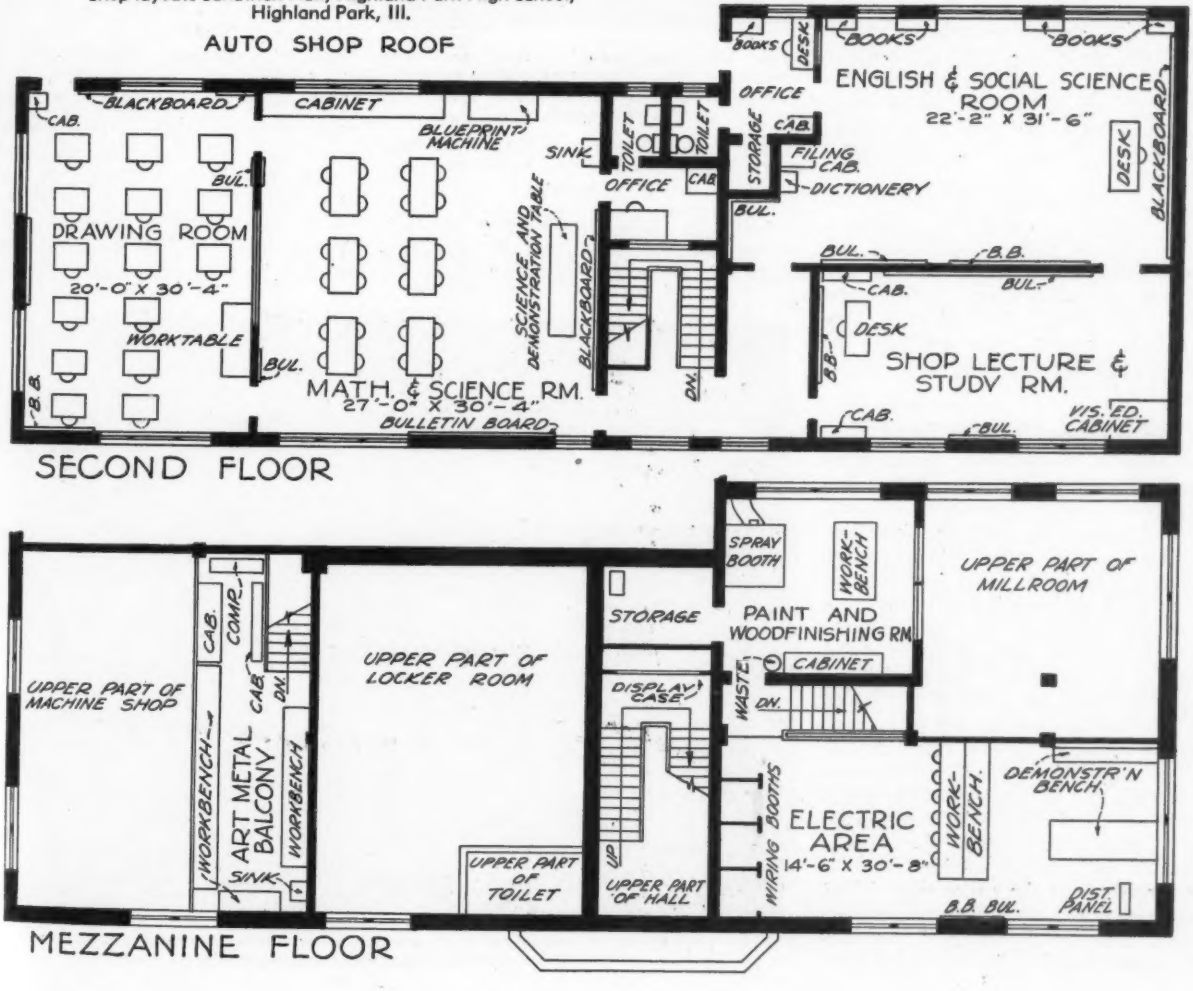
Twelve-inch square black and red marbleized asphalt tile form the floor covering for the second floor, halls, and building trades shop. All classrooms, shops, and offices have electric conduit installed for public-address system for future use.

To make the best use of visual aids, about 50 per cent of the available wall space in the classrooms has a 42-in. wide cork bulletin board. On the remainder instead of the traditional slate blackboard a brown composition board is used, which is easier on the eyes and not as expensive as slate. The shop lecture room can be easily darkened for the showing of films, slides, and opaque projection. The wall spaces in the school shop may also be used for displaying visual aids. On one of the walls in the building trades shop is a panel 2 by 18 ft., in which six enlarged photographs of industry are exhibited. Different sets of pictures can be inserted, each showing a particular process in the production of materials used in construction.

On the landing of the main stairs is a display case, the main purpose of which is to exhibit the results produced by the

The building of the sash and the doors was part of the millwork which the students did on the building

Shop layouts Sandwick Hall, Highland Park High School, Highland Park, Ill.



hobbies of the community, so as to stimulate leisure-time activities. Switches for light, low-voltage currents, and compressed air are accessible to operate the exhibits. Throughout the building the latest ideas in scientific lighting are employed.

In the interest of hygiene, adequate toilet, washroom, and shower facilities are provided. Each student has an individual locker and is supplied with clean towels. Each of the four teachers has his own office and washroom, with a shower for the shop teachers. The partial glass partition between the office and classroom permits the teacher to observe the class while he is at his desk or in conference. A glazed partition between the drawing and mathematics rooms permits the instructor to carry on instruction in either room without disturbing the other and still have both under observation.

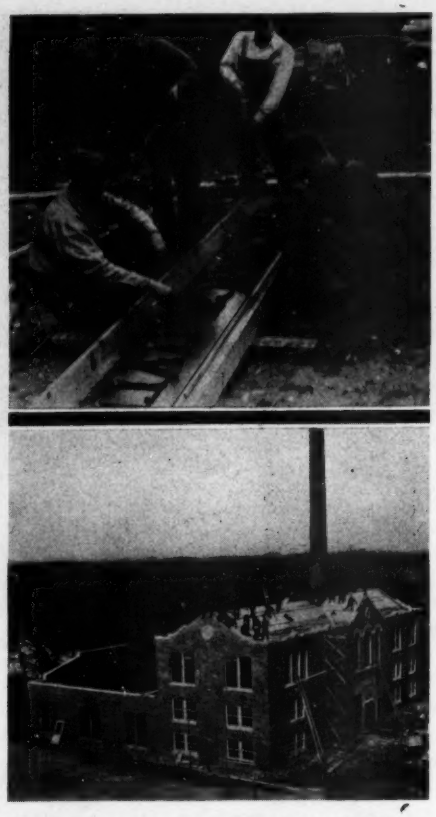
The Auto and Metal Shop

On the main floor a large space has been reserved for auto repair. The reason is obvious. There students work on live cars, repair motors, iron out bumps, paint, wash, grease, and perform other operations pertaining to the repair and upkeep of the automobile. In addition to this repair work, these students receive instruction in forging, electric and acetylene welding, heat treatment of steel, and machine-shop practice The equipment for this work is so placed that the large floor area is available when desired. The machine shop, which formerly occupied one side of the auto repair area, is now quartered in the remodeled section and is separate from the rest by a wire screen partition.

Industrial-arts students use this entire area one half of each day. On a balcony over the machine shop is equipment for art metal work which these students get in addition to machine-shop practice, auto and other metalwork. Even though there is a toolroom, most tools are kept on panels over workbenches or in places where they are used.

The Building Trades Shop

This shop is divided into six areas to give experience in the six major building trades: bench and millwork, sheet-metal work, bricklaying and concrete, plumbing, electric house wiring, and painting or wood finishing. Tools, books, and instructional materials are kept in each area rather than in a central location. It is the plan to alternate between one year in the shop and one year on a construction job. During the year in the shop the student will spend three hours a day for six weeks in each of the six areas to become familiar with the tools, materials, and trade information of each trade and to develop sufficient skill to carry on the fundamental tool operations. As each area is small, the class of 24, divided into groups of from four to six, is spread about the entire shop. Thus, no one area is crowded. The machines in the wood area are so arranged that materials longer than 12 ft. can be accommodated by opening a window or door. Instead of the traditional woodworking bench a locker unit forms the pedestal for the bench tops and affords considerable storage space. It has been learned from fatigue studies in industry that workbenches facing the window interfere with efficiency; however, with the short and diversified hours of these students this is a minor item.



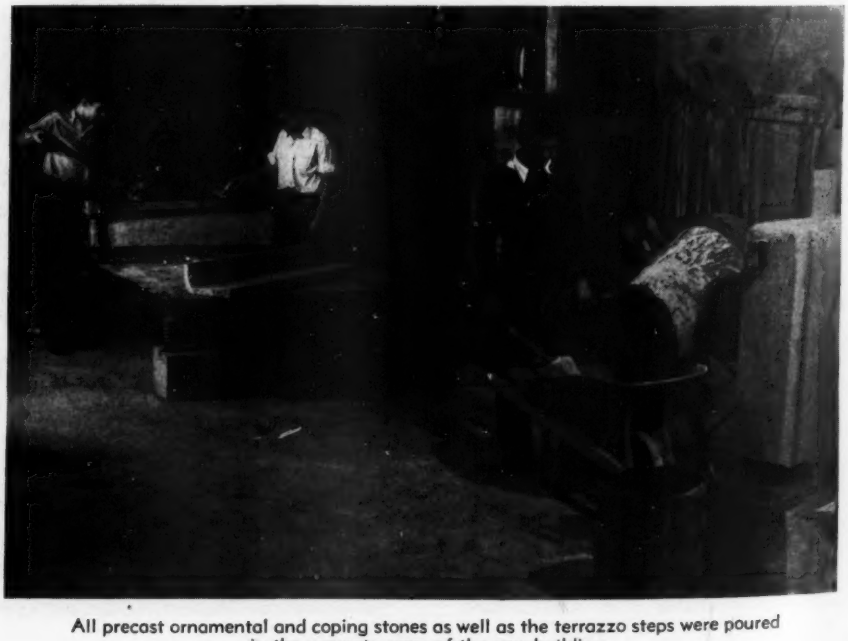
(Top) The name plate "Sandwick Hall" was formed out of wood and then cast in concrete. Here is the last step in the process, the casting of the plate

(Lower) Sandwick Hall is getting a roof over it and soon it will be closed in and ready for winter weather

As a safety measure, an asphalt tile is used on the floor in the working areas of machines and benches. The carborundum impregnated asphalt tile, recently placed on the market, is of the same size and thickness as the rest of the tile. The power distributing panel is a dead-front, pull-fuse type with a switch on the main line. Circuit breakers would have been more desirable, but the budget did not permit their use. The ceiling of this shop is treated with fire-resistive acoustical tile to absorb the air-borne noises. The transmission of machine vibration to the building has been considerably reduced by 1 in. thick rubber cushions under the machines.

The paint and wood-finishing room, which usually is considered the place of greatest hazard in a school shop, has a concrete floor and ceiling, masonry walls, one-hour fire-resistive doors, and wire glass windows between it and the shop. The floor is constructed like a bathtub with a drain to prevent water damage to rooms below in case a fire opens the sprinkler system. In addition to the necessary equipment this room has a metal spray booth with adequate exhaust fan to remove the fumes.

The concrete and brick area in the basement removes that rather mussy work from the traffic lanes of the shop. The lumber storage room also in the basement is somewhat misplaced in relation to the wood shop, but has proved quite satisfactory in spite of its location. When the relative humidity becomes extremely high



All precast ornamental and coping stones as well as the terrazzo steps were poured in the concrete room of the new building

The completed building. Sandwick Hall, the new vocational building

The rear view of the building showing the separator of the dust and shaving collector system

during the spring and summer, more uniformity is maintained in this partially sealed concrete chamber. Provision has been made to connect the radiators of the lumber room with the domestic hot-water supply of the school during the season when the rest of the building does not require heat.

Student-Built Equipment

The spray booth, metal cabinet, and table for the paint and welding booths, stock rack, workbench, and other equipment in the auto and machine shop were built by the students in the metal classes. The building trades students constructed the vibrating table; electric distributing panel; drawing and mathematics tables; work stools; electric work and demonstration benches; the plumbing, sheet metal, concrete, and woodworking tables and cabinets for tools and materials in the various work areas. As need arises other articles will be made, as the policy is to permit the students to get this experience.

How Much of the Building Construction Did the Boys Do?

The construction of the building was started by the students in September, 1937; and now after three years, the building is practically completed. During this the fourth year we hope to see most of the equipment ready for use.

The excavation for the main section of the addition was let by contract; the students, however, did the hand excavating for the footings and the underpinning of the old building. Carpentry, such as formwork for footings, basement walls, beams, columns, and floors, as well as the roof construction and shingling, was done by the students. The window frames for the first floor of the addition and all the exterior window sash were purchased. After the basement and the first floor of the addition had been enclosed, woodworking machines were installed and the students proceeded with their own millwork. This gave them the opportunity to make the rest of the window frames, all the doors, and interior sash and cases, as well as all interior trim.

The rather extensive electric layout for both power and light was installed by students with the assistance of a journeyman electrician. The ornamental stone, which included window sills, coping, ornaments in the gables and above windows, and the 110 stones for the entry were precast by the boys in the basement of the new shop. As mentioned previously they made a vibrating table and steam-curing chamber to produce a smooth, dense product. Accuracy and patience in the building of the many different forms for these stones was demanded. Though discouraged at times the students were spurred on by the sight of beautiful castings as the forms were pulled.

The building of the dust collection system presented interesting sheet-metal problems in design. The drafting of the patterns in the drafting room, and the making and installing of the fittings and pipes were also the work of the boys. The fan, heavy gauge exterior piping, and the separator were purchased but were installed by the students.

The setting of the asphalt tile base and the laying of the tile floor brought in new experience for them, and several became quite proficient in that work. The work of glazing the sash, painting, staining, and varnishing the woodwork was a job for the less active students who preferred to be painstaking rather than energetic. Yards and yards of gravel and sand were shoveled into the mixer, and the concrete wheeled and placed into forms; but the boys enjoyed this heavy work and always were on hand early on the day when pourings were to be made.

To expedite the project and comply with state and local laws, the brickwork, steam fitting, plumbing, and plastering were let by contract to outside trades, but students assisted when their interest was aroused and time permitted. Moreover, as some of these trades demanded certain skills and repetition of operation, it was advisable to employ skilled mechanics.

In order that the students may better understand the various processes of industry in the production of the many materials used in construction, a frame holding 6 enlarged photographs is exhibited on the wall of the building trades shop. Different sets of pictures can be inserted

Many people are interested in the attitude of labor toward student activities of this type. Labor needs to understand the purpose of such projects and their exploratory value and preliminary general trades training, for their own sons as well as for other boys. Labor wants to be consulted, and permitted to advise, as well as participate on the job and in return expects the school to be willing to cooperate in training apprentices and to offer evening classes for journeymen. When a school takes the trouble to meet these requirements, labor will be willing to aid rather than hinder such an educational undertaking. Fortunately, workers who are primarily selfish and refuse to consider the general welfare of the trade and the development of good members of their craft, are in the minority. In the erection of Sandwick Hall, labor was very helpful.

The project of erecting a building and the making of equipment is, however, only a means to an end. It is true that the department now has a home of its own, a physical setting where a more desirable trade training program can be carried on. The real significance of such an undertaking is not only the diversified experience in the use of tools, materials, and academic training, but also learning to work more such practical vocational experiences the cooperatively, and to acquire a greater appreciation for the skills required in industrial production. When the secondary school offers opportunities which permit transition from school to occupational pursuits will be more gradual. The student will then have experienced life rather than prepared for an abstract representation of it.

The sheet-metal shop where all necessary pipes and elbows were made

Industrial Education at Iowa State College

T. A. HIPPAKA*

The first task here was to survey the industrial-education facilities already available as well as the most immediate needs which had to be met. Certain recommendations naturally were made on the basis of this study. With the most excellent cooperation of everyone, considerable headway has been made in meeting these various needs. Professor William L. Hunter and his associates who preceded us had done much good work, and what they did here will always remain a valuable asset to the college.

Further promotion of undergraduate work was of primary importance. Consequently our offices, shops, and laboratories have been completely painted and otherwise rehabilitated by electricians, plumbers, and steam fitters. A considerable amount of money has been expended for new equipment, all of which has been installed. With newly decorated shops and much additional machinery we now find ourselves in an advantageous position to proceed with the work. We felt that without adequate equipment it was impossible to educate teachers capable of teaching shop subjects as they should be taught.

Far-reaching curriculum changes have already been made in order that we may better provide for the needs of our students. There will always be changes in

Electrical Work at Iowa State College

*Professor Industrial Education, Iowa State College, Ames, Iowa.

Planning at Iowa State College

course content when conditions warrant them, and as new demands are made of our graduates.

Library facilities in industrial education have been greatly improved through the purchase of a substantial number of new books. These books, of course, will be placed in our shops where they will be readily accessible to all students.

Particular attention has been paid to the establishment of agreeable working relations with the personnel of all other departments and divisions. And what an interesting experience that has been for this part of our work has entailed the making of many contacts and becoming acquainted with new faces in a new place. Surely there is no part of any school job more important or more interesting than this phase of it. The fruits of one's efforts generally come back in terms of good will and cooperation, and we surely have enjoyed a very generous share of both during the time that we have been here.

Then there is the happy relationship that we enjoy with the engineering division where much additional shopwork is made available to our students. Content of technological courses in the various engineering shops is being closely integrated with the work done in our own laboratories. In other words, a well-balanced program of shopwork where skills and technological advances receive due emphasis is a reality for every student. Especially where a student has had an opportunity to spend some time in industry, this experience coupled with all of the shopwork offered here should make him a good craftsman.

Woodworking at Iowa State College

There are certain very definite qualifications that every teacher of shop subjects should possess. Certainly he must be in possession of the fundamental skills and knowledges so essential to good teaching in any industrial subject. His craftsmanship must be of such high quality that students will respect him for it. His pupils will know that he is an expert in his field and will regard him as such. Essential hand skills cannot be acquired in a few six-week courses, to say nothing of the many other qualifications that our teachers must have before they are ready to accept a position.

A good teacher knows whom he is teaching. He is well grounded in psychology and the knowledge of human nature. Such a person knows how to get the best from his students, and consequently, high standards of workmanship are attained and always insisted upon. Well-organized and carefully integrated courses in psychology are a definite part of the teacher-education program.

The *how* of teaching is important. Therefore, it is necessary to gain the mastery of method. Courses in the methodology of teaching coupled with an opportunity to do student teaching are made a regular part of the program. Theory of method is closely correlated with actual teaching in a public school situation. Plans for an industrial-education laboratory school are under way. Every possible means will be employed to teach future instructors how to teach the shop subjects for which they have first acquired the necessary basic skills and knowledge.

It is essential for the teacher to know why he is teaching a certain subject. He needs to have a philosophy of education and of life in order that the work may have functional value for the student. He must see where his work fits into the general school program and life itself as we live it here in America.

Since space does not permit a lengthy discussion, only a brief reference is made to some of the other attributes that a teacher should possess. It is necessary for him to be an adjustable individual who is well fortified with a broad, rich background of training and experience. He should possess a genuine belief in himself and in the subject that he is teaching. High professional standards and ideals should be adhered to and fostered at all times. Surely the teacher needs to know something about employee-employer relationships in industry and the problems of each. What are the social and economic problems of the people in the community in which he lives? The teacher needs to possess fine personality traits in order that he may be a fitting example for youth. He must be aware of his importance and

relationship to others in the school organization as well as in the community. Above all, he should be a positive, constructive influence for good in this community and school.

Industrial education on the Iowa State College campus is an integral part of all teacher-education effort. In this same picture are agricultural education, home-economics education, rural education, science education, and vocational education. Progress is being made in the direction of integrating and correlating all of this work both on the campus and in the state through the state department of public education, and the Iowa Vocational Education Association.

The teacher of shopwork must be acquainted with the whole field of industrial education which includes handwork in the elementary school, the exploratory and tryout courses in the junior high school, the work in the senior high school, trade training, and adult education. He needs to be able to fit into both the general shop situation and the unit shop type of organization where there may be a very real emphasis upon trade and vocational training. It is essential for him to know the problems of the small school as well as those of the large school.

It may appear that the job specifications set up here for an industrial-education teacher are rather exacting. On the other hand, the modern public school system is a complex one, and every prospective teacher must possess these skills, knowledges, professional standards, and ideals in order to succeed in it. When we consider the far-reaching importance of our work, teaching truly is a most vital profession, worthy of our very best efforts at all times.

Undergraduate courses, both academic and shop, will be offered during the regular school year as well as during the summer terms. This work is not to suffer at the expense of the graduate program. Both have a place, and both will thrive here without in any way hampering each other. When we consider the facilities and the concerted efforts of a well-trained staff which are available here in all departments, academic and otherwise, and when all of these are brought to bear upon both undergraduate and graduate teacher education, we realize that we are in a most advantageous position to do a very creditable piece of work on both levels.

Concrete Work at Iowa State College

General Metal Work at Iowa State College

Iowa State College offers unusual opportunities for graduate study. The outstanding work of the various departments is well articulated for this purpose. Library facilities are excellent, and the school is well staffed. Certainly anyone contemplating graduate study in industrial education should be well grounded in the fundamental skills and knowledges described earlier in this article. He should have succeeded in an actual teaching situation. It is then that the graduate student is ready to build upon a sound background of training as well as experience; to prepare himself for greater service in his chosen profession; and to make research in his major field an important phase of graduate study.

Make it thy business to know thyself, which is the most difficult lesson in the world. — *Cervantes.*

Actions, looks, words, steps, form the alphabet by which you may spell character. — *Lavater.*

We Produce Men and Mechanics

EDWARD C. ESTABROOKE*

I recently read an article by an outstanding New England educator entitled, "Let's Produce Men — Not Mechanics." It is one of the most challenging I have ever read! Challenging, because it emphasizes again a weakness that we in the vocational field are well aware of — our inability to interpret vocational education to the American public as adequately as we would like. The very title of this professor's article provides tangible evidence that he, and undoubtedly many other academic educators as well as laymen, firmly believe that the vocational schools of America are turning out mechanics who can earn a good living but who haven't learned how to live.

The national magazine which published the gentlemen's treatise is read by 1,600,000 women. There are probably a half million men who also read it. Here is an article addressed to over 2,000,000 adult citizens! It's purpose is to expound the virtues of a purely academic type of education for high school youth and explain how vocational education produces mechanics — but not men.

The title "Let's Produce Men — Not Mechanics" rubbed my fur the wrong way when I first saw it. My temperature began to rise by the time I had read the first few paragraphs. Then I came across a statement that would make any vocational educator's blood boil! When anyone says that our vocational program is so wrong it may do incalculable harm to secondary school education — I, for one, won't hesitate to jump in and provide the "opposition." The following retort was submitted to the magazine in question in order to state the case for vocational education as I see it, to show how we produce *men as well as mechanics*.

Such evaluation of the human products of our vocational schools by those who are not fully acquainted with them is not surprising. They have heard much lately of vocational education for national defense, and their minds turn naturally to the urgent training of machinists, welders, sheet-metal workers, electricians, auto mechanics, and other craftsmen essential to defense industries. They think of the specialized courses in the mechanical trades that are being offered in many of our vocational schools. This vocational program for National Defense is an emergency type of training provided for adults only. Every trainee must be at least 18 years of age by the time the training period is completed. Applicants are selected not from the vocational schools but from industry and from public employment office registers.

They are trained as quickly as possible for jobs essential to the National Defense Program. The vocational schools must produce mechanics from among these men — men who beg for training they want and need in order to fill industrial jobs. The necessity for specialized preparation in the present defense situation confines the instruction in most cases to the purely mechanical or manipulative phases of industrial work. There is no time to worry about producing men who may be taught to appreciate poetry, to comprehend the worth and dignity of life, or to use their leisure time more profitably. This is an emergency!

A Defense Training Program

During the past summer we conducted such a program in the vocational school in Bradford, Pa. Auto mechanics, electricians, electric arc welders, oxyacetylene welders and machinists worked eight hours each day regaining lost skills and developing new ones. The men ranged in age from 18 to 45 years. Many were high school graduates; some had previous trade experience; others were assigned for training from WPA rolls. All had one idea in mind — to acquire skill — enough skill to secure a job in the rapidly expanding defense industries. They wanted economic security, which meant mechanical skill and enough self-confidence to sell it.

In defense training we produce mechanics because they are needed and we are prepared to do the job. But wait. Let us consider the men who are produced. What affect does the acquisition of skill — the ability to do a constructive piece of work, have on these men, particularly those who have been out of a job for some time? Here is a point worth mentioning! As I interviewed the unemployed applicants I sensed a dejected attitude, a feeling of inferiority in many of the men. After the first week or two of training a marked improvement in outlook and morale became evident. The men arrived at school earlier, hurried to set up their machines and apparatus, forgot about taking that five minutes off for an outside smoke, cut their lunch period short. They worked like Trojans! Why? A spark of encouragement had been kindled, a feeling of accomplishment restored, lost confidence rebuilt. Before the six weeks training period ended nearly one fifth of the trainees had been taken by industry. On the last day of school we gathered the men together for a short commencement program — and the word *commencement* really meant something to them. It marked the beginning of a new era for many of the men. They had something to sell — skill; they had something else just as valuable — confidence, a combination hard to beat. At the close of the program I asked the men if they wished to say anything before we parted ways. One man rose to his feet and spoke, "I am 45 years old. I finished the fifth grade in school — never had a chance to get more education until this summer. I am sorry this course is ended because I have learned much and made many friends. I appreciate all that has been done for me. I will not forget. Thank you." A short speech — a rather homely one, but full of sincerity and feeling that meant much to me and the instructors assembled there that day. This man and 70 per cent of the entire group are working today. I frequently see some of them in local industries and in our evening trade extension classes, and I wonder. Have we produced only mechanics or have we somehow helped to produce better men as well? I sincerely believe that we have done both.

Let us not confuse the comparatively short defense training course with the all-day vocational programs conducted throughout the country for the youth of high school age. For purposes of this discussion the term "vocational" is used to mean "vocational industrial," that is — vocational education dealing with the trades and industries. Whereas in defense courses our primary responsibility is to train mechanics, the main objective of day vocational schools is to produce *Men and Mechanics*. The majority of these schools in America are much the same in character because they operate under the Smith-Hughes and George Deen Laws, passed by the Congress of the United States. I would like to use the Bradford Vocational School as an example, and explain how it attempts to produce *Men and Mechanics*. Let's first consider some of the fundamental aims or objectives of vocational education as it is carried on there.

Objectives for Vocational Education

1. To help boys to become employable — to acquaint them with the major vocational processes in the trade so that they may be apt learners on the job and to be able to adjust themselves to varying conditions and requirements in the occupational field of their choice.

2. To provide a broad comprehensive training in the trade field rather than emphasize any specialized phase of trade work.

3. To develop proper work habits and attitudes toward work — accuracy, neatness, safety, industry, and the like.

4. To develop qualities of initiative, dependability, honesty, cooperation, and others that are essential to success in any position.

5. To develop qualities of leadership in boys who are capable of becoming the leaders of tomorrow.

6. To develop a knowledge of related

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and academic subjects and an appreciation of the importance of these subjects to the industrial and cultural life of the worker.

7. To develop problem solving ability — the ability to think logically, to analyze carefully and to solve problems as they arise.

8. To provide a knowledge of the kind of training necessary for advancement in the field, and of where and how to obtain that training.

9. To develop a desire in students to continue learning throughout life.

10. To help students make profitable use of leisure time.

11. To confirm the vocational choice of the students — to assist them in finding their proper places, to discover whether or not their physical and mental abilities are such that they will enjoy their work and be able to make a success in it.

12. To place graduates in jobs and follow them up to assist them in *making good* as workers and citizens.

Do these objectives stress the skill angle of vocational training? Only the first two points make any mention of it! In the first place we can't turn out completely skilled mechanics in a three-year course. Ask any master auto mechanic, electrician, or machinist how long it took him to get that way. Three years is not time enough! In the second place, we wouldn't want to produce expert mechanics even if we could — unless they had many other qualities to accompany their skill. To what extent is skill developed? Let's listen to a vocational graduate who is being interviewed by a machine-shop superintendent about a job. The boy is talking, "I have spent 15 hours a week in the machine shop of our vocational school for three years — a total of 1620 hours. During this time I have learned the names, uses, and principles of the various hand and machine tools in the shop. I can set up and operate a lathe, shaper, milling machine, drill press, grinder, and other machines. You won't have to spend your time and money teaching me the many fundamentals of machine-shop practice. I am not a skilled machinist now, but I can become skilled and productive in your plant with some additional practice." If we can develop in students enough skill for them to get a foothold in industry, our skill aim is fulfilled. Our major job is to produce *men*.

The state plan for vocational education in Pennsylvania provides that 50 per cent of the total instructional time shall be devoted to practical shopwork, approximately 30 per cent to related work, and 20 per cent to general education subjects.

The Vocational Program

Let's take the lid off the vocational program and find out how it produces men. First, the shops. It is here where a boy gets acquainted with human beings and discovers that he himself is one of them. He learns that tolerance, courtesy, honesty and cooperation are qualities more valuable than skill alone. In the shops a boy learns to share. Sometimes he works alone and frequently with other boys on group projects. "Is it fair," he asks himself, "to turn in dull or dirty tools or mistreat my machine?" "Other boys must use them too, and I'll need them some time again myself," says he. He develops a respect for property and acquires a real sense of values. He learns that the safe way of doing things is the only way, not only in the shop but on the highway and in the home. The safety program helps him to develop a safety consciousness that carries over throughout life. He finds that accuracy and neatness pays, that dependability, initiative and other such qualities must be developed to succeed anywhere. He confronts situations which improve his ability to think clearly, to use good judgment, to solve his own problems. He takes part in the student personnel organization — becomes cleanup man, safety supervisor, and shop foreman. His leadership ability is tested here. He does his best because the outstanding foreman from each shop is selected as guest of the Bradford Foremens' Club at its monthly dinner meeting at the "Y." The boy wants to rub elbows with the foremen from local industries, to introduce himself to them, to tell what goes on in his own school shop, and to learn about the problems foremen have. It is in the shop where a boy learns to give and take, to be logical and sympathetic and broad minded; where he is taught to live serenely and happily and charitably. It is here where both head and hands are used — *with emphasis on the head*, where real life situations make learning purposeful, where opportunities for self-expression abound, where personality, character, and an understanding of one's responsibility for social well-being are developed.

What about the other 50 per cent of the vocational program — the related and academic phases? The related subjects (mathematics, science, and drawing) are so called because of their close relationship to most trade processes.

Let's take related mathematics. The boys review fractions, decimals, percentage, ratio and proportion, and other fundamentals of arithmetic. They study algebra, geometry, and trigonometry, and discover that mathematics isn't a vague, difficult subject when applied to practical trade problems. The presentation of mathematics not only as an exercise in "higher mental gymnastics," but as an invaluable aid to the craftman's work, makes sense to the students. Many boys for the first time learn to like mathematics because they see how it is applied and used in a practical manner.

Related-science instruction covers the mechanics of solids and fluids, sound, light, heat, magnetism and electricity, and other principles of physics as well as chemistry. The laws and principles, wherever possible, are applied to tools, machines, and processes represented in the vocational shops. There is one important difference between the related science and the college-preparatory course in physics or chemistry. In related science the instruction is more closely correlated with life situations. Vocational boys know why these subjects should be mastered. They see the subjects actually applied in their daily work. Science makes sense under these conditions!

Mechanical drawing is the third related subject which ranks in importance with the other two. It is the language which expresses and records the ideas and information used in most trades and industries. Here the boys learn to know the alphabet, the grammar and composition, become familiar with the idioms and the accepted conventions and abbreviations. They learn how to make and interpret drawings. Here skills are developed — yes, but so is a lasting appreciation of neatness, accuracy, and good design.

Mathematics, science, and drawing have long been conventional academic subjects. I studied them in my college preparatory course in high school. At that time they seemed to be just subjects I had to pass in order to meet college entrance and soon forgotten. Why? Because theories were not applied to practice. Vocational boys who study these subjects as *related* to their fields of work have a purpose in learning. Motivating factors are present, and motivation is a powerful stimulus to learning in any educational situation.

The academic subjects in the vocational curriculum are considered just as fundamental to the adequate preparation of a boy as the shop and related work. We feel that the vocational student needs as rich a background in cultural studies as does the college-bound pupil, and perhaps more so, as his formal education usually terminates sooner. Our boys take three years of academic English along with other boys and girls in the high school. They study poems and plays and essays. They learn to know and appreciate the famous literature of the past and of the present — not from a vocational, but from a cultural standpoint.

All vocational students take a year's course in American history. They study the great movements in the development of our country, their purposes and contributions to America as we know it today. They learn, as all men should, that it is wise to look back to keep from losing their way; to look ahead to keep from stumbling. A knowledge of the colonial period, the conflict for independence, the constitution, the rise of the industrial system, national growth and world politics, democracy, and the responsibilities of individuals in a democracy, helps boys to contribute more than mechanical skill to their fellow men.

We have one more course in the vocational curriculum. It is called industrial history and is given five hours each week to all sophomores. One of the course objectives is to develop a knowledge of the history and present status of American industries. But this is by no means the only aim. We believe that in order to fur-

ther broaden the outlook and the preparation of vocational boys for their job of living we should provide as wide a range of experiences as possible in school. For this reason occupations in various industries are described, qualifications of workers discussed, opportunities for graduates pointed out. Boys write letters to leading industrial concerns requesting information. They do research work in the school and shop libraries, give committee and individual reports on their findings. One entire period each week is devoted to five- or ten-minute talks. So far this year each boy has given at least three speeches before his class. Topics of every description have been presented — "What We Do in Electric Shop," "Chicken Raising as a Hobby," "Democracy on the March," etc. Their public speaking ability is improving rapidly. The boys realize the importance of being able to express their ideas adequately, the value of being able to conduct a meeting, to give directions clearly, to carry on an intelligent conversation. Stress is laid on good written and spoken English, and on correct spelling. Panel discussions are held on employer-employee relations, economic problems, international relations, democracy, and other live topics. Students are urged to read the newspapers, periodicals, and trade journals regularly. Visual aids are used extensively to provide desirable vicarious experiences.

Is this type of education narrow in scope? Does it produce only mechanics or is there a remote possibility that vocational graduates will leave school with some conception of how to live as well as how to work. It is true that we have many wonderful machines in America today. I do not believe that they can run away with our nation as long as we in vocational education continue to produce *men and mechanics*.

The Midget Wiggly Block Test for Mechanical Ability

HOWARD O. REED*

The writer has been interested in the construction of a test to measure the mechanical ability of high school boys. Mechanical ability being defined as the ability to do shopwork successfully in the school shops. The results from such a test can be used as part of the basis for vocational guidance, as well as for educational guidance. The results could also be used for grouping students in shop classes.

Construction of the Test

The construction of the test presented four problems, which were: (1) To construct a test which would require some manipulative skill as well as the ability to see the relationships of the pieces. (2) To construct a test so the subject would start with a simple job and proceed to the more complex. (3) To construct a test so the shapes of the pieces could be detected to eliminate trial and error as far as possible. (4) To construct a test which would not have any two pieces alike.

The test is made up of four wooden ¼ by ¾ by 2½-in. blocks. One block is jig-sawed lengthwise into four pieces. One cut is made with corners and the other is made with a curve; thus the relationship of the pieces can be detected. This block is labeled, *Block 1,* in Figure 1.

The second block is jig-sawed lengthwise into six pieces. One cut is made with corners, one with a curve, and the third an interlocking joint. The interlocking joint was made to require more manipulative skill in assembling, than those which could be just laid together. This block is labeled, *Block 2,* in Figure 1.

The third block is jig-sawed lengthwise into nine pieces. One cut is made with corners, two with curves, which are different, and the fourth an interlocking joint. This block is labeled, *Block 3,* in Figure 1.

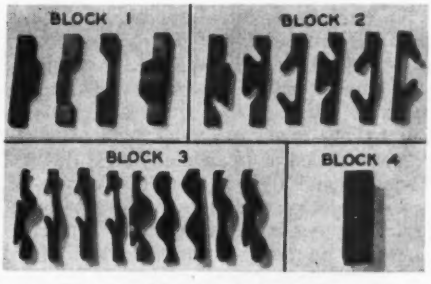

Fig. 1. The Midget Wiggly laid out ready for the student to assemble

Trying Out the Test

The test was first given to 61 boys and the time required to assemble each block, as well as the total time, was recorded. It was thought that correlations could be computed between the four and six, the four and nine, and the six and nine piece blocks to give some indication of the reliability of the test. Inspection of the data obtained in this way was convincing enough that the score obtained with one trial was not reliable enough to use for individual purposes. A second trial was given and only the total time was recorded. A correlation between the first trial total and the second trial total for the 61 cases gave "r" value of plus .44.

It was obvious that more than two trials were necessary to obtain a sufficiently reliable score. The test was given to 128 boys and just the total time recorded for each of the three trials. Since there was a rather wide variation in 22 of these cases, a fourth trial was given them. Eleven made a slight decrease in their score and 11 made a slight increase. Table I shows variation in consistency of highest and lowest trials in the 128 cases.

TABLE I. Showing the Variation in Consistency of Highest and Lowest Trials in 128 Cases

Score	*Trial*	*Number*	*Per Cent*
Lowest	1	84	65.6
(longest	2	30	23.4
time)	3	13	10.1
	4	1	0.9
Highest	1	9	7.0
(shortest	2	56	43.7
time)	3	58	45.3
	4	5	4.0

There is evidence that learning takes place as indicated by the information secured from 21 boys who were given the test 10 times. The mean of the 10 scores for each trial of 21 boys is shown in Table II.

Analysis of the Data

Something had to be done to obtain greater reliability than a *puzzlelike* test of this sort yields. This may seem like a crude comparison, but it is worth considering at this point: When a foot rule is placed in the hands of a boy to measure the length of a board, he may return and say that it is 56 in. long. Another boy may take the same rule and measure the same board and report that it is 53 in. long; while a third boy might get 57 in. for the length of the board. Now, which one of the boys is correct? To estimate the nearest true length of the board we would likely take the average of the two most consistent, which is 56 and 57, that would give an estimated length of 56½ in. If the latter boy had returned with a measure of 59 in., a fourth boy might

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TABLE II. Showing the Learning Which Takes Place from Practice of 10 Trials of the Block Test in 21 Cases

Trials	*1*	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*	*10*
Meantime	5.44	3.93	3.99	3.69	3.32	3.01	2.67	2.74	2.49	2.07

have been sent in order to have two more consistent measurements. If the information that the board was anywhere between 53 and 59 in. in length would serve the purpose, it is very likely that the fourth boy would not have been sent to measure it.

In this case we have an instrument, the foot rule, reliable for all practical purposes, in the hands of incapable or unreliable measures. It is apparent that the wiggly block is an unreliable instrument, and to make scores more reliable *consistency* must be the slogan. It is on this basis that the reliability is increased. The test was given three trials and the two most consistent of the three trials were averaged to obtain the score.

Reliability

A correlation between the two most consistent of the three and four trials gave "r" a value of plus .90, P. E. ± .012. A correlation between the first score and a second score, obtained in the same manner two months later, for 64 cases gave "r" a value of plus .82, P. E. ± .027.

Validity

A correlation was computed with five criteria to establish the validity of this test. Table III shows the results of this part of the study. The Otis I.Q. scores were obtained from the school records, and were from the "Otis Intermediate Thirty-Minute" test. The achievement scores were obtained by finding the mean of the student's four high school marks. Tapping scores were obtained by having the boys tap as fast as possible for 30 seconds. The general-shop marks were taken from the school records, and the machine-shop marks were the shop marks before they were adjusted by test grade, notebook, etc.

TABLE III. Showing Results of Correlation of Block Scores with Various Criteria for 15-Year-Old High School Boys

Criteria	*N*	*r*	*P. E*
Otis I.Q. score	103	.014	
Achievement average of 4 marks	125	.17	±.066 ±.059
Tapping	78	—.52	±.075
Shop (general)	121	.465	±.047
Shop (machine)	26	.696	±.070

As a further means of validating this test the author selected 20 boys, 10 who had a poor score and 10 who had a good score, mixed their names on a sheet of paper with the following instructions to two shop teachers:

Will you please rate these boys as to their mechanical ability. Disregard attitude, interest, behavior, attendance, etc., as much as possible and rate only as to ability to do shopwork. Eliminate any test grades, or apparent knowledge of related material from influencing the rating — just the ability to do shopwork. Rate, *average, below average,* and *above average.*

The 10 with the best scores (all in the first quartile) were rated as follows: 3 above average, 6 average, and 1 below average. The 10 with the poorest scores (all in the fourth quartile) were as follows: none above average, 3 average, and 7 below average.

TABLE IV. Showing Comparison of Teacher Rating with Scores of the Block Test

Students	*Above Average*	*Average*	*Below Average*
10 from Q_1	3	6	1
10 from Q_4	0	3	7

This rating was on the basis of teacher observation as to ability to do shopwork and not on achievement as indicated by the shopwork.

Since the beginning of the present school year the author has had 33 riveting hammer heads made and turned in by students who have taken the block test. Three of the best students in the advanced class (all having made a similar hammer last year) were asked to carefully rate the 33 hammers, and arrange them in order from best to poorest. Other than the student's locker number being stamped in the metal there was no means of identification. After the hammers had been arranged, the author counted off the 10 best and placed them away from the remainder, then the 10 poorest were separated from the remainder. One of the boys read off the numbers of the hammers and the score of that person was looked up and jotted down. The results of this comparison are shown in Table V.

TABLE V. Showing Comparison of Poorest and Best Hammers with Quartile Ranking on the Block Score

Hammers	Q_1	Q_2	Q_3	Q_4
10 Best	4	4	0	2
10 Poorest	1	1	3	5

The mean of the block scores of the 10 best = 91st percentile.

The mean of the 10 poorest = 11th percentile.

Conclusions

The score an individual makes on this test must be interpreted in the light of its validity. It appears that the test is more valid for machine shop which consists of such operations as measuring, drilling, filing, tapping, turning, etc., than for general shop where some electrical work was involved. This leads one to suspect that a further special ability is used in this work, although the sampling is too limited to draw any conclusions on this point. The failure to show a worth-while correlation with general intelligence indicates that special abilities are being explored.

The results from the block test have been used by the author for grouping seventh- and eighth-grade boys in the general shop. The records show that occasionally a good shop boy has been placed in a slower group, but seldom was a slow shop boy grouped with the better group.

It would be well to tell an individual that the score from this test is merely a small link in the long chain of evidence that the student should know about himself in order that he may make an intelligent vocational choice.

THINGS TO THINK ABOUT

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The purpose of education is to develop individuals into happy, useful, and successful citizens. This is the end toward which all our educational efforts are directed.

Happiness is a rather complicated individual reaction which may come, and usually does, from a great variety of stimuli. It represents a considerable degree of satisfaction at our progress toward the realization of some of our hopes, ideals, and ambitions. It is not a durable state which can be based upon something accomplished, but is associated with progress toward a goal.

Usefulness involves the ability and the desire to contribute toward the satisfaction of our own wants and the wants of others.

Experiences which contribute to, or facilitate, the satisfaction of one's wants, to the development of one's hopes and desires, and to establishing controls may be said to be educational experiences, in the broad sense.

Success is a relative term and like reputation represents in a large degree what others think of us. Success usually is associated with one's standing in a vocation as well as with his progress. One's own feeling with respect to his success, whether it is shared by his acquaintances or not, has much to do with his happiness. If one finds himself in the upper part of his vocation, usually he is happy; if in the lower part, often he is not.

DO YOU KNOW THAT

Eighty-four per cent of all motor vehicles involved in fatal accidents were going straight ahead?

In 77 per cent of the cases the road was dry!

Saturday and Sunday are the worst days — 7 to 8 at night, the worst time. — *Milwaukee Safetygram.*

Graphic Aids in Continuous Occupational Analysis

CLYDE A. BOWMAN*

(Continued from March, 1941, issue of Industrial Arts and Vocational Education)

In the first article, sample graphic applications of the organization, travel or flow, content, and index relationships in continuous occupational analysis were suggested. Examples were taken from the field of architectural drawing. In this article these relationships are illustrated in another field and some additional uses of the index graph are developed.

Figures 7, 8, and 9 illustrate the use of the organization relationship and the travel or flow relationship in setting up analysis material for directing and planning instruction in vocational work in the paper and pulp industry. Figure 7 is a

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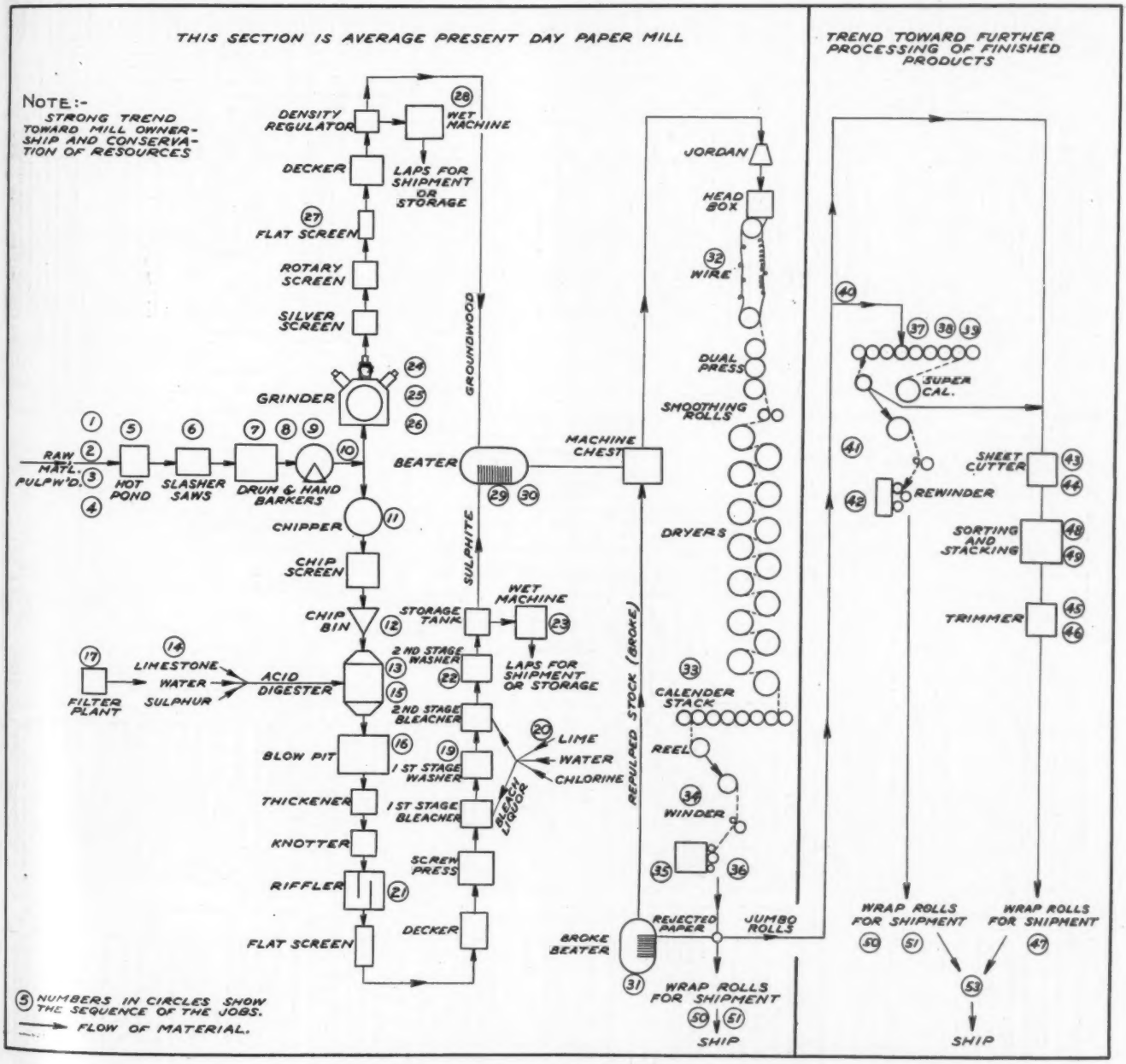
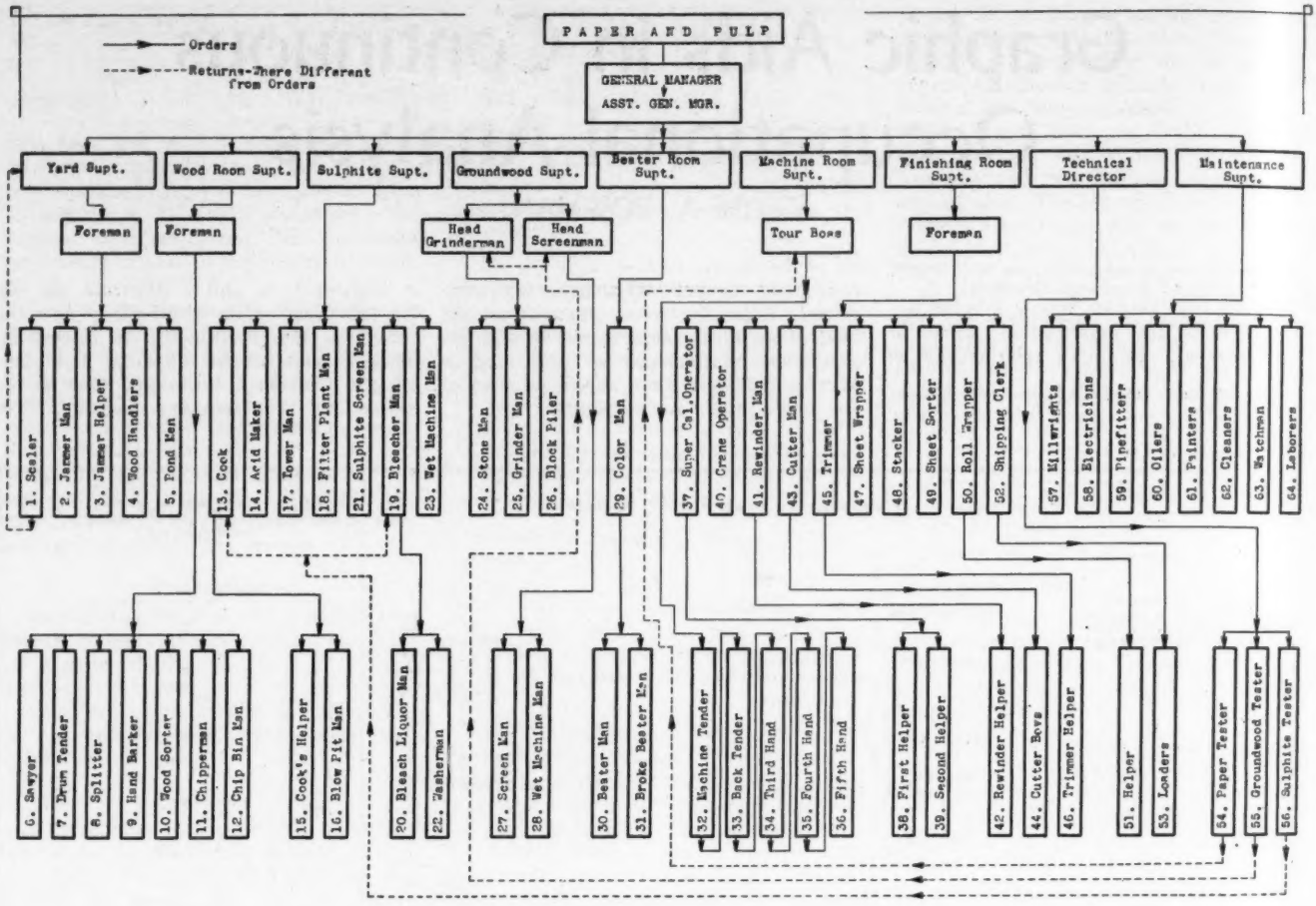


Fig. 9. Flow chart, courtesy John F. Natwick, Wisconsin Rapids, Wis.



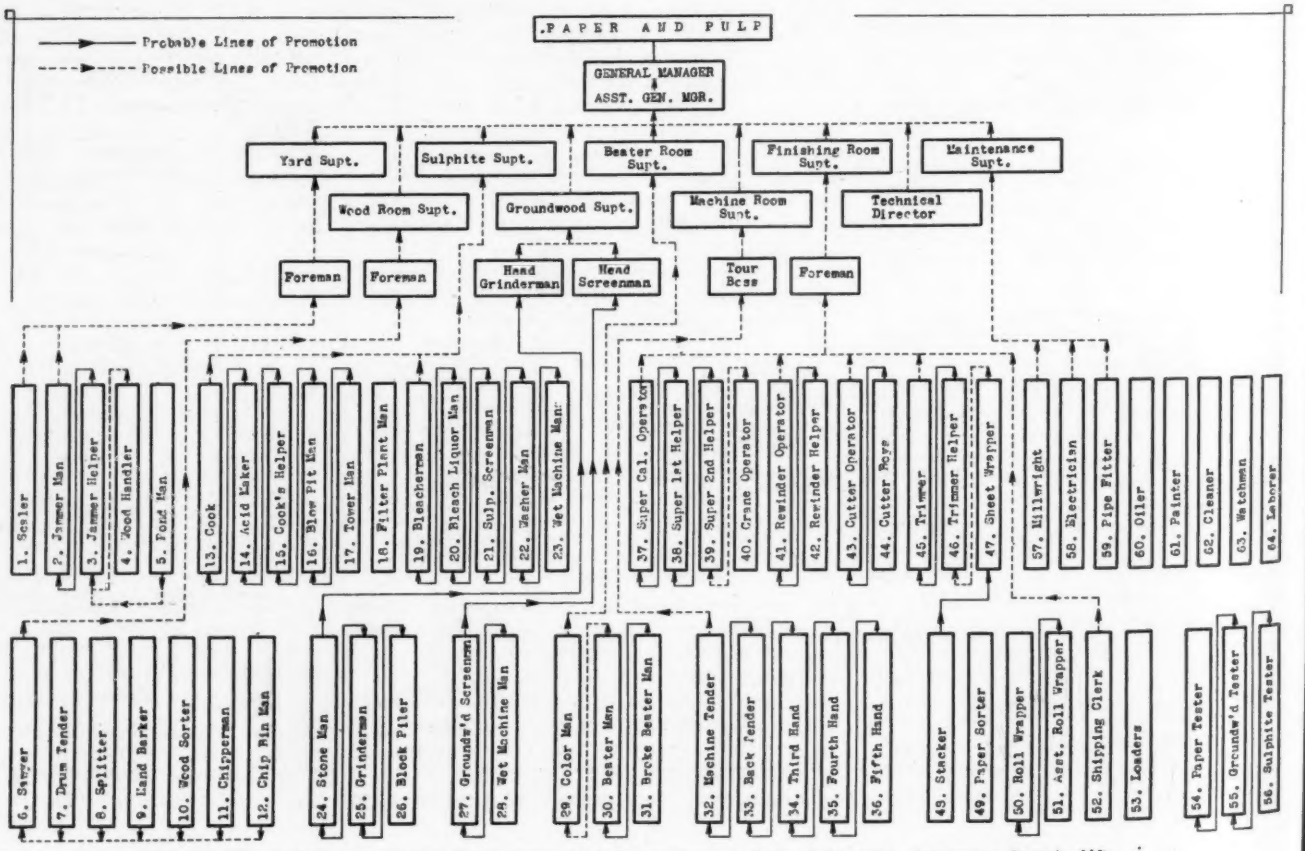


Fig. 7 is upper diagram, and Fig. 8 the lower. Both by courtesy of John F. Natwick, Wisconsin Rapids, Wis.

55. Groundw'd Tester
56. Sulphite Tester
63. Watchman
64. Laborer
55. Groundwood Tester
56. Sulphite Tester
64. Laborers

TOTALS 1920	TOTALS 1929	TOTALS 1930	TOTALS 1933	TOTALS 1934	YEAR OF SURVEY	To Read: I. All information for one state. A. Find name of state B. Follow vertical line-top down C. Horizontal lines indicate items of information. Figures in squares tell number, etc. II. Item of information for all states. A. Find information wanted B. Follow horizontal line C. Vertical lines indicate states.	SOUTH ATLANTIC STATES: DELAWARE	MARYLAND	VIRGINIA	WEST VIRGINIA	NORTH CAROLINA	SOUTH CAROLINA	GEORGIA	FLORIDA	EAST SOUTH CENTRAL STATES: KENTUCKY	TENNESSEE	ALABAMA	MISSISSIPPI	WEST SOUTH CENTRAL STATES: ARKANSAS	LOUISIANA	OKLAHOMA	TEXAS	MOUNTAIN STATES: MONTANA	IDAHO	COLORADO	NEW MEXICO	ARIZONA	UTAH	WYOMING	NEVADA	PACIFIC STATES: WASHINGTON	OREGON	CALIFORNIA	DIST. OF COLUMBIA
						GENERAL INFORMATION																														
105,710	116,317	122,775	125,693		'30	Population (In thousands)	238	1631	2421	1729	3170	1738	2908	1468	2614	2616	2646	2009	1654	2101	2396	5824	537	445	1035	423	436	507	225	91	1563	953	5677	486
9,231	3,334	29,545	23,643	24,933	'34	Motor Vehicles (In thousands)	54	332	373	194	439	202	376	335	332	336	225	174	196	244	477	1312	128	108	274	82	96	101	64	32	422	274	2006	163
2,941* (*1921)	3,334	3,333			'30	Roads (In thousands)	5	17	68	38	63	62	110	38	68	74	72	67	76	52	127	209	75	42	77	58	32	27	44	27	46	56	89	
			4	4	'34	Gas Tax (Per gallon)	3	4	5	4	6	6	6	7	5	7	6	6	6½	5	4	4	5	5	4	5	5	4	4	4	5	5	3	
						Persons per motor vehicle	4.4	4.9	6.5	8.9	7.2	8.6	7.7	4.4	7.9	7.8	11.7	11.5	9.4	8.6	5	4.4	4.2	4.1	3.8	5.2	4.5	5	3.5	2.8	3.7	3.8	2.7	
						SAFETY INFORMATION																														
13,869	27,066	29,080	29,323		'33	Traffic Deaths	84	429	592	382	725	342	651	494	504	540	485	283	280	395	485	1292	115	117	298	102	147	135	87	63	442	249	2253	
						Safety Rating-1st Safest																														
						By Population	45	33	29	21	23	11	24	44	9	15	6	1	4	7	12	20	19	35	40	26	43	34	47	48	39	31	46	
	25.5* (1925)			21* (*1935)	'36	Deaths per 10 million gallons gas	18.1	20.9	28	29.5	34.2	34.2	33	23.7	30.4	31	33.5	33.9	27.5	23.4	20.6	20.7	18.7	24.4	18.6	31.2	307	23.6	22.5	24.1	21.8	20.3	21.5	
						Motor Vehicle Laws																														
					'36	1. Certificate of title and anti-theft	X	X	X	X	X			X				X			X		X	X	X	X	X	X		X	X	X	X		
					'36	2. Drivers license law with examination	X	X	X	X		X			X										X		X	X			X	X	X		
					'36	3. Minimum age law	16	16		15	16	14	16	14	16	16	16								15	14	16	16	15	15	16	15	16		
					'36	4. Chauffer's license	X	X	X	X			X	X			X	X	X	X		X	X	X	X		X	X		X		X	X		
					'36	5. Financial responsibility	X	X	X		X														X								X	X		
					'36	6. Driver license law without examination																								X						
					'36	7. Certificate of register	X	X				X	X	X	X	X	X		X	X		X	X	X	X	X		X	X	X	X	X	X		
					'36	8. Guest hazard	X				X	X			X									X	X				X		X	X	X		
					'36	9. Non-resident service of process law			X			X		X				X													X	X	X		
					'36	10. Hitch-hiking law			X																			X				X			
					'36	11. Compulsory insurance																														
						OCCUPATIONAL INFORMATION																														
						Garages																														
42,151		50,715			'30	Owners & Proprietors	112	538	415	413	379	140	355	561	686	440	295	213	457	354	906	2423	376	228	720	198	213	103	140	89	909	703	3528	90
Listed together		19,247			'30	Managers & Officials	29	238	223	216	244	47	226	238	340	305	136	106	128	144	405	936	132	110	248	92	89	115	91	24	309	195	1169	66
Not Avail.		384,188			'30	Automobile Mechanics (Factory-Garage-Shop)	597	4428	5769	3692	6002	2800	5818	6672	5511	5789	4681	3366	3640	4949	7828	19459	1834	1462	4137	1231	1829	1719	782	406	7202	4370	30,068	1749
31,482		56,693			'30	Garage Laborers	115	870	911	621	1170	371	969	975	1069	1303	813	630	531	1124	1330	4400	239	148	648	228	213	176	115	63	693	438	2919	324
Not Listed		9,452			'30	Operatives	7	128	147	73	82	63	170	128	99	118	143	60	85	166	199	436	39	28	108	24	56	40	16	9	170	130	908	43
28,768		61,507			'30	Retail-Automobile & Access. Dealers	88	713	857	546	884	449	998	1011	714	885	757	545	573	637	1436	3464	235	228	680	156	292	245	104	71	996	614	4787	335
Not Listed		89,190				Filling Stations																												
					'30	Employees	149	608	1405	631	2808	1132	2049	2435	952	1180	1237	1070	1231	1344	3569	7305	384	364	1020	366	539	307	174	112	1933	1211	8145	290
						Factories																												
83,341		123,717			'30	Laborers	36	50	455	38	269	22	207	79	568	2179	47	41	214	181	272	372	2	2	206	1	1	16	0	0	180	72	883	43
121,164		161,957			'30	Operatives	45	217	607	70	332	31	316	229	986	890	83	17	92	235	364	799	7	6	294	7	31	36	12	1	367	207	2404	16

Fig. 11. The second half of this chart follows on the next page

TOTALS 1920	TOTALS 1929	TOTALS 1930	TOTALS 1933	TOTALS 1934	YEAR OF SURVEY	To Read: I. All information for one state. A. Find name of state. B. Follow vertical line-top down C. Horizontal lines indicate items of information. Figures in squares tell number, etc. II. Item of information for all states. A. Find information wanted B. Follow horizontal line C. Vertical lines indicate states.	GEOGRAPHIC DIVISIONS OF THE UNITED STATES — NEW ENGLAND STATES: MAINE	NEW HAMPSHIRE	VERMONT	MASSACHUSETTS	RHODE ISLAND	CONNECTICUT	MIDDLE ATLANTIC STATES: NEW YORK	NEW JERSEY	PENNSYLVANIA	EAST NORTH CENTRAL STATES: OHIO	INDIANA	ILLINOIS	MICHIGAN	WISCONSIN	WEST NORTH CENTRAL STATES: MINNESOTA	IOWA	MISSOURI	NORTH DAKOTA	SOUTH DAKOTA	NEBRASKA	KANSAS
						GENERAL INFORMATION																							
105,710	116317	122,775	125,693		'30	Population (In thousands	797	465	359	4249	687	1606	12,588	4091	9631	6646	3238	7630	4842	2939	2563	2470	3629	680	692	1377	1880
9231		26,545	23,843	24,933	'34	Motor Vehicles (In thousands)	178	113	77	785	142	357	2269	864	1681	1618	803	1458	1148	709	697	666	739	156	169	406	528
2941* *(1921)	3,334	3,333			'30	Roads (In thousands)	22	15	16	19	3	16	96	18	103	96	80	107	89	91	117	111	122	113	126	102	148
			4	4	'34	Gas Tax (Per gallon)	4	4	4	3	2	2	3	3	3	4	4	3	3	4	3	3	2	3	4	4	3
						Persons per motor vehicle	4.4	4.1	4.6	5.4	4.8	4.5	5.5	4.6	5.7	4.1	4	5.2	4.2	4.1	3.7	3.7	4.9	4.4	4.1	3.4	3.6
						SAFETY INFORMATION																							
13,869	27,066	29,080	29,323		'33	Traffic Deaths	190	135	70	801	97	452	2784	1105	2190	1829	979	1943	1196	627	525	514	770	101	115	283	482
						Safety Rating-1st Safest																							
						By Population	28	41	10	8	2	38	22	37	25	36	42	30	27	18	13	16	17	3	5	14	32
	25.5* (*1925)			21* (*1936)	'36	Deaths per 10 million gallons gas	16.6	13.1	17.7	14.3	10.1	15.8	17.1	17.2	19.2	22.2	25.7	20.1	22.1	17.3	17.3	13.4	17	16.2	13	13.9	18.6
						Motor Vehicle Laws																							
					'36	1. Certificate of title and anti-theft								X	X		X	X	X	X	X		X		X		X
					'36	2. Drivers license law with examination		X	X	X	X	X	X	X	X		X		X			X						
					'36	3. Minimum age law	18	16	18	16	16	16	18	17	16		18	15	14	16	15	16	16		15		13
					'36	4. Chauffer's license	X	X		X	X	X	X	X		X	X	X	X	X	X	X	X				X
					'36	5. Financial responsibility	X	X	X		X	X	X	X	X		X		X	X	X			X			
					'36	6. Driver license law without examination	X													X	X						
					'36	7. Certificate of register	X	X	X	X	X	X	X		X	X	X	X			X	X	X	X	X		X
					'36	8. Guest hazard			X		X	X				X	X	X	X	X		X		X	X		X
					'36	9. Non-resident service of process law	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X						
					'36	10. Hitch-hiking law	X				X	X	X	X	X						X						
					'36	11. Compulsory insurance				X																	
						OCCUPATIONAL INFORMATION																							
						Garages																							
42,151		50,715			'30	Owners and Proprietors	554	435	310	1565	693	693	5760	1803	3445	2556	1619	3553	2105	1738	1737	1873	1464	436	520	960	1191
Listed togeth.		19,247			'30	Managers & Officials	146	92	84	783	231	231	2397	601	1327	1039	565	1272	754	564	449	484	593	189	186	309	379
Not Avail.		394,188			'30	Automobile Mechanics (Factory-Garage-Shop)	2887	1622	1355	14939	5363	5363	42,118	14,649	24,296	23,472	11,118	25,881	23,039	9600	8959	1349	11,925	1855	2225	4787	6099
31,450		66,693			'30	Garage Laborers	349	224	199	1776	783	783	9203	2206	6478	3662	1959	5219	2555	1466	1080	484	1973	358	327	675	1025
Not Listed		9,452			'30	Operatives	26	22	11	337	89	89	1078	337	592	60	265	635	407	189	168	189	275	32	51	103	215
28,768		61,507			'30	Retail-Automobile & Access. Dealers	420	189	142	2328	871	871	6422	2283	4235	217	1909	3773	2966	1281	1222	1304	1841	233	276	761	1279
Not Listed		89,190				Filling Stations																							
					'30	Employees	329	226	154	2291	1161	1161	6148	2353	3587	143	1908	4429	3609	1797	1762	2467	2798	483	704	1453	2240
						Factories																							
83,341		123,717			'30	Laborers	10	11	2	414	155	155	2793	1873	4493	217	8483	1875	80,568	3639	705	410	1668	11	10	341	122
121,164		161,957			'30	Operatives	22	64	6	2703	502	502	7971	2267	4626	584	10,456	3775	92,520	5803	998	435	3161	12	19	222	198

Courtesy John L. Feirer, Industrial Education Dept., Western State Teachers College, Kalamazoo, Mich.

NO PATTERN REQUIRED	III Side View Only	II Top and Side View	TRIANGULATICE Top View Only	APPROXIMATE	RADIAL	PARALLEL LINE

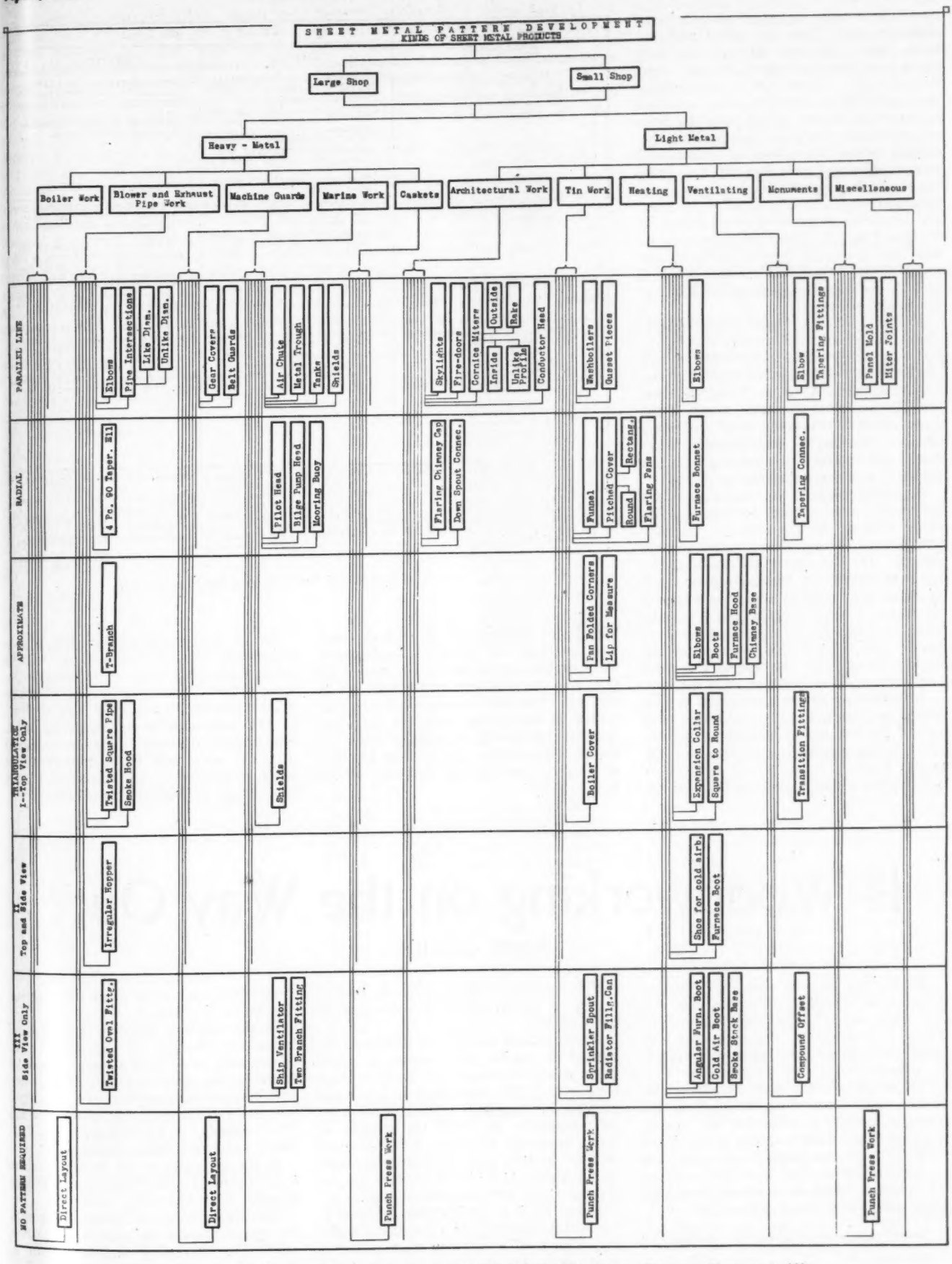


Fig. 12. Courtesy of Floyd Keith, Dept. of General Metal and Sheet Metal, Stout Institute, Menomonie, Wis.

941
Courtesy John L. Feirer, Industrial Education Dept., Western State Teachers College, Kalamazoo, Mich.
121,164 | 161,957 | 130 | Operatives | 22 | 64 | 6 | 2703 | 502

conventionalized organization chart to show the main lines or orders and the main lines of returns. Returns are indicated in dotted lines where different from lines of orders. Figure 8 is an organization chart arranged to show the same personnel as shown in Figure 7, but with the lines of promotion, probable and possible, indicated rather than lines of orders and returns. Figure 9 is a flow chart indicating the flow of material in paper and pulp manufacturing. The numbered circles show the locations of the workers identified in Figures 7 and 8. These numbers may be used in numbering content analyses and instructional material. They may be used also in an index of instruction material for ready reference.

Figure 10 is an index chart locating change in the paper and pulp work. Typical happenings which affect this industry are listed at the bottom of Figure 10 and numbered from 1 to 8. These numbers are distributed in the nine areas in the index chart locating the results of these changes classified by technological, structural and functional, and organization, travel or flow, and content.

Figure 11 suggests the manner in which the index chart can be developed to include several classifications at the top, and several classifications at the left, all related. In the development of automechanics material, frequent use is made of statistical material to indicate trends by states, by regions, and on a national basis. Frequently it is very difficult to handle this material readily in instruction. Figure 11 suggests the use of the index chart as an aid in handling such material.

A further use of the index chart is illustrated in Figure 12. In sheet-metal work one of the frequent difficulties is the handling of instruction in pattern development. Figure 12 is for the purpose of relating the kinds of sheet-metal products, both heavy and light metal, with the various methods of pattern development. Classifications of products are across the top. The classifications of methods are at the left. The two classifications are connected in the several areas in the chart through the naming of products under the classifications at the top, opposite the type of pattern development involved at the left.

	TREND OR CHANGE		
	TECHNOLOGICAL	STRUCTURAL	FUNCTIONAL
ORGANIZATION	5. Coating crew added to regular machine crew. 7. Increasing use of electric trucks removes men from hand trucking jobs.	1. Foresters and lumber-jacks added to personnel of paper and pulp industry. 5. Coating men added to structure of paper mill organization. 6. Super calendering of paper necessitates changing men from other jobs to this work. 8. News print and kraft mills move south.	5. New function of machine coating causes addition of new workers to mill personnel. 6. Function of super calendering adds new workers.
TRAVEL OR FLOW	5. Machine coating adds another step to the manufacturing process.	1. Raw material begins flow in the woods rather than in the woodyard. 6. Super calendering of paper lengthens the travel of material through the mill.	1. Paper industry adds function of forestry and conservation to other functions. 5. The ordinary paper mill is taking over the function of furnishing coated paper to society--has been done by papercoating plants. 6. Super calendering is an additional function being added by mills.
	2. Sulphite workers learn new pulping methods. 3. Bleachermen learn new bleaching methods. 4. Use of Norton stone in grinding adds new content to grinderman's job. 5. Machine coating adds content to paper machine jobs. 8. Use of southern pine as pulpwood means addition of much new content to pulping processes.	5. Men transferred to coating job must learn new content. 6. Men transferred to super calender must learn content associated with this job.	5. Machine men have to learn new duties and knowledge in connection with coating paper on paper machine. 6. New function of super calendering adds new content to be learned by certain workers.

1. Trend toward ownership and conservation of natural resources.
2. Development of new methods of cooking sulphite, namely chemi-pulp and f.m.p.
3. Development of direct chlorination and causticization in bleaching process.
4. Rapid extension in use of Norton artificial stone in grinding.
5. Development of methods for coating paper on the machine.
6. Extension in application of high finish paper by the super calendering operation.
7. Displacement of men by electric or gasoline industrial trucks wherever possible.
8. Development of southern pine as commercially feasible pulpwood.

Fig. 10. Courtesy of John F. Natwick, Wisconsin Rapids, Wis.

In the final article the graphic aids in continuous occupational analysis will be taken from other fields of industrial content. While the general plan is the same in the graphic recording of the analyses in the various fields of industrial work represented in general education industrial arts and vocational trade and industrial work, nevertheless, each occupational area has certain individual characteristics.

Is Woodworking on the Way Out?[1]

JOHN CLAUDE*

During the past 10 years, the question whether woodworking is on the way out has been asked again and again. The Bruce Publishing Co. files show that year after year more woodshops were started in schools.

These shops in the high schools, for instance, were more than doubled in the years from 1924 to 1930, i.e., the number jumped from 4500 to over 9000. From 1930 to 1935 the number remained more or less stationary, but from that year on to 1940, over 2000 more school woodshops were added to the high school list.

This certainly indicates a healthy growth as far as woodworking is concerned in the schools.

As vocational and technical schools increased in number, the number of woodshops also grew accordingly. In 1924 there were about 450 woodshops giving trade training in carpentry, cabinetmaking, or patternmaking. By 1930 the number of shops increased to about 1050, dropped off a bit in 1931 and 1932, but then went up to about 1100 in 1933 and has remained fairly stationary since then.

From this it is evident that woodworking is still important as a vocational training subject. The question then arises, is it justified? The United States Census for 1910, 1920, and 1930 gives the information shown in Table I.

In the furniture industry a number of interesting changes are occurring. Wisconsin used to produce a great amount of furniture, but it now has only 81 factories, and North Carolina has 118. Michigan still has 155 factories, but New York has 713; Illinois, 283; Pennsylvania, 230; Ohio, 142; and Massachusetts, 198.

In the aggregate, it will be noticed there is a continuous gain in the number of men engaged in woodworking industries.

The Department of Commerce, through its questionnaires to various industries, offers the interesting findings shown in Table II.

[1]Analysis given at the Wisconsin Vocational Association convention held at Manitowoc, Wis.

*Milwaukee, Wis.

The question may be asked, which industries have enlarged the job opportunities for woodworkers? For carpenters the greatest opportunity is offered in reinforced concrete and steel buildings. A school friend of mine once was bemoaning the fact that in his placement work he was having difficulty in placing carpenters. I asked him to put on his hat and coat and walk just three blocks with me and I'd show him where he could place 25 carpenters immediately. He came along with me and when we got there, he pointed to a new concrete structure that was just starting, saying, "That's why carpenters can't get work." I said, "Look again." He blushed, bought the cigars and went to work. Ultimately, 75 of his carpenters were working on that building.

For cabinetmakers, radio has been a lifesaver. Probably a large part of the gain in the number of cabinetmakers may be attributed to radio. Then, too, our population is increasing, and there is a continual need for new furniture.

The automobile industry, of course, has increased job opportunities for the patternmaker.

In the aviation industry, practically all work starts with a carpenter. Before a new ship can go into production, good carpenters create full-sized wooden "mock ups" as they are called, in order that the sheet-metal worker and the fabricator of structural members can devise correct forms and shapes.

In the motion-picture industry, the carpenter also plays a most indispensable role in the building of stage settings, etc. Some of these Hollywood carpenters have been working for 20 years and have never worked on a complete house. These men, however, must, in most cases, possess greater skills than those who spend all of their time in the pursuit of normal carpentering.

Obviously, all of this doesn't indicate that woodworking is on the way out. Industrial shifts may put it out of a certain locality, but as an industry and as a trade activity, woodworking is bigger and better than ever.

1. *Operatives in the Lumber Industry*

	1910	1920	1930
Foresters —			
Forest rangers	4,332	3,563	8,057
Timber cruisers			
Lumbermen —			
Raftsmen	161,268	205,315	162,233
Choppers			
2. *Basic Woodworkers*			
Carpenters	817,120	887,379	929,426
Carpenter apprentices	6,069	4,805	4,138
Cabinetmakers	41,892	45,511	57,897
Patternmakers	23,559	27,720	29,750
3. *Woodworkers in Manufacturing*			
Furniture factories	44,640	55,717	75,235
Piano and organ factories	18,953	19,852	8,177
Saw and planing mills	66,060	57,320	58,896
Other woodworking factories	38,618	35,830	35,059
4. *Laborers*			
Building construction	935,781	682,722	1,115,667
Car and railroad shop	48,342	56,643	37,789
Wagon and carriage factories	12,391	9,817	1,419
Lumber and furniture industries	317,244	320,613	333,539
Lumberyards and coalyards	60,061	68,543	73,232
Retail dealers — lumber	27,250	27,687	34,070

Forest Products — Aggregate

	Number of Estab.	Wage Earners	Wages	Value of Products
1937	18,012	694,341	$636,724,139	$2,439,530,184
1935	16,127	579,012	438,395,310	1,662,220,620
1933	12,295	454,171	289,096,768	1,127,404,693
1931	16,016	509,665	440,176,241	1,646,921,527
Planing Mills — sash and door factories, etc.				
1937	2,858	66,814	$ 67,000,000	
1935	2,753	48,297	42,000,000	
1933	2,356	35,388	26,000,000	
1931	3,453	54,493	58,000,000	
Furniture and Related Industries				
1937	3,283	173,984	$176,000,000	
1935	3,221	133,772	116,000,000	
1933	2,566	108,298	78,000,000	
1931	3,340	131,310	130,000,000	

Plastics, Cellulose, etc.

86 Establishments in 1931
160 Establishments in 1937
5,000 Employed in 1931
16,000 Employed in 1937
$ 6,000,000 Wages in 1931
$19,000,000 Wages in 1937

Unclassified — Lumber and Timber Products

	Number of Estab.	Wage Earners	Wages
1937	7,645	323,928	$275,000,000
1935	5,981	255,230	183,000,000
1933	3,783	189,367	113,000,000

SYMBOLS TRIUMPHANT

Robert F. Keagle, Hazleton, Pennsylvania

Symbols are often misleading
And often misguiding as well
For no one is ever quite certain
Their acceptance to rightly foretell;
Sometimes their meaning is hidden
By the veil that our future shrouds,
Sometimes their purpose is darkened
By adversity's somber clouds,
But oh, the symbols triumphant
That occasionally we see!
Such as the one that I tell of now
That recently came to me.

Together we stood at the workbench,
A growing boy and I,
Conversing about the years to come
And what might in them lie,
About the problems of living
And the challenges of life,
About the proper training
In strengthening for the strife.
We spoke of courage and fortitude
And we lauded high ideals,
We mentioned the pride in accomplishment
That a finished craftsman feels,
Then, I asked him a leading question
And awaited his reply
But not a word he answered
And this is the reason why:
He had not heard my query
For his mind had taken flight
Into the infinite future
Where everything seems bright,
The eyes of his youth were dreamingly fixed
On horizons far away,
His countenance enraptured
Reflected some distant day. . . .
Then I caught it, the symbol
That made my heart expand!
Subconsciously he was grasping
A hammer in his hand.

It was not destruction's ponderous sledge
That his fingers were fondling
Nor was it the spike-studded bludgeon
That selfish oppressors swing,
But it was the tool of a builder
And it fitted his youthful palm
As easily as twilight shades
Blend with evening's calm!
There will be little to worry about
In freedom's favored land
As long as our boys face the future
With hammers in their hand.

INDUSTRIAL ARTS and VOCATIONAL EDUCATION

John J. Metz, Editor

Getting Ready

All who are engaged in the strenuous work carried out at so many schools in behalf of the National Defense Training Program, must of necessity strive for the development of greater and greater efficiency, if their work is to be of real value in the safeguarding of our particular type of democracy.

It is unfortunate that America has been so shortsighted that this necessary work was neglected until the eleventh hour. It may be human to wait until the horse is stolen before locking the barn, but it surely is not a wise procedure.

One would think that our statesmen and political leaders would have had enough foresight, considering the state of affairs in Europe, to have thought seriously about equipping our Army and Navy so that we would be at least partially prepared to defend our country against enemies from within or without.

For years great numbers of our workers, many of them highly skilled, were kept at inconsequential emergency jobs, when, according to present reports, America was in no way ready to protect itself against any second- or third-class power that might want to attack us. Why were they not then employed at the jobs which now are looked upon as so important?

Yet, now that the need for National Defense is so apparent, all caviling should be put aside and every effort should be made to work speedily and accurately. As William S. Knudsen of the defense commission has said, it is imperative that we "put everything we have, without stint, into our jobs" and that we must "forget everything except the welfare of our country."

John W. Studebaker, U. S. Commissioner of Education, in one of his communications to the state directors and supervisors of vocational education, and to city and county superintendents of schools adds another word of advice that should not be overlooked. In substance he says, "Those who are connected with this defense work are under heavy strain. They should, therefore, order their lives so that they can maintain themselves in the best of health." This is of utmost importance because a man who is not fit physically cannot normally accomplish his best, and since speed is such an important factor in the defense work, be it in school or in the factory, constant efforts must be made to improve every phase of our work so that it may be done well in the shortest possible time.

Both administrators and instructors should subject their defense training efforts to continuous critical analysis so that if, as, and when necessary, the American system of democracy will be in a position to defend itself effectively.

Shop Reference Libraries

Recently an advisory committee on public library service was appointed by the U. S. Commissioner of Education. Members of this committee will serve as counselors to the library service division of the Office of Education in a study which is being made to determine the public library resources and needs in defense areas.

Commissioner John W. Studebaker feels that this study is necessary because of the increased demand for technical books which has been noted since the National Defense Training Program was inaugurated.

Many teachers of industrial arts and vocational education have long ago sensed the need for such reference libraries in their school shops and some schools have provided books to help the student as he takes up various shop subjects. Practically every up-to-date laboratory of industry has its planning area. Shelves for reference books are a necessary item of equipment for this section of the room, and many of these laboratories provide excellent selections of books, catalogs, portfolios of designs, and the like for the use of their students. These books, housed where they are readily accessible, are used a great deal. This also helps the students develop the habit of making use of reference material more freely.

On the whole, however, too little attention has been paid to this valuable teaching aid, and this projected study by the Office of Education ought to have a very beneficial effect.

Gutzon Borglum

One of America's most outstanding sculptors has passed away. Gutzon Borglum was born March 25, 1871, in Idaho. His parents were Danes, the father being a physician. An older brother, also a sculptor, is noted for outstanding pieces of statuary prepetuating the early days of the West.

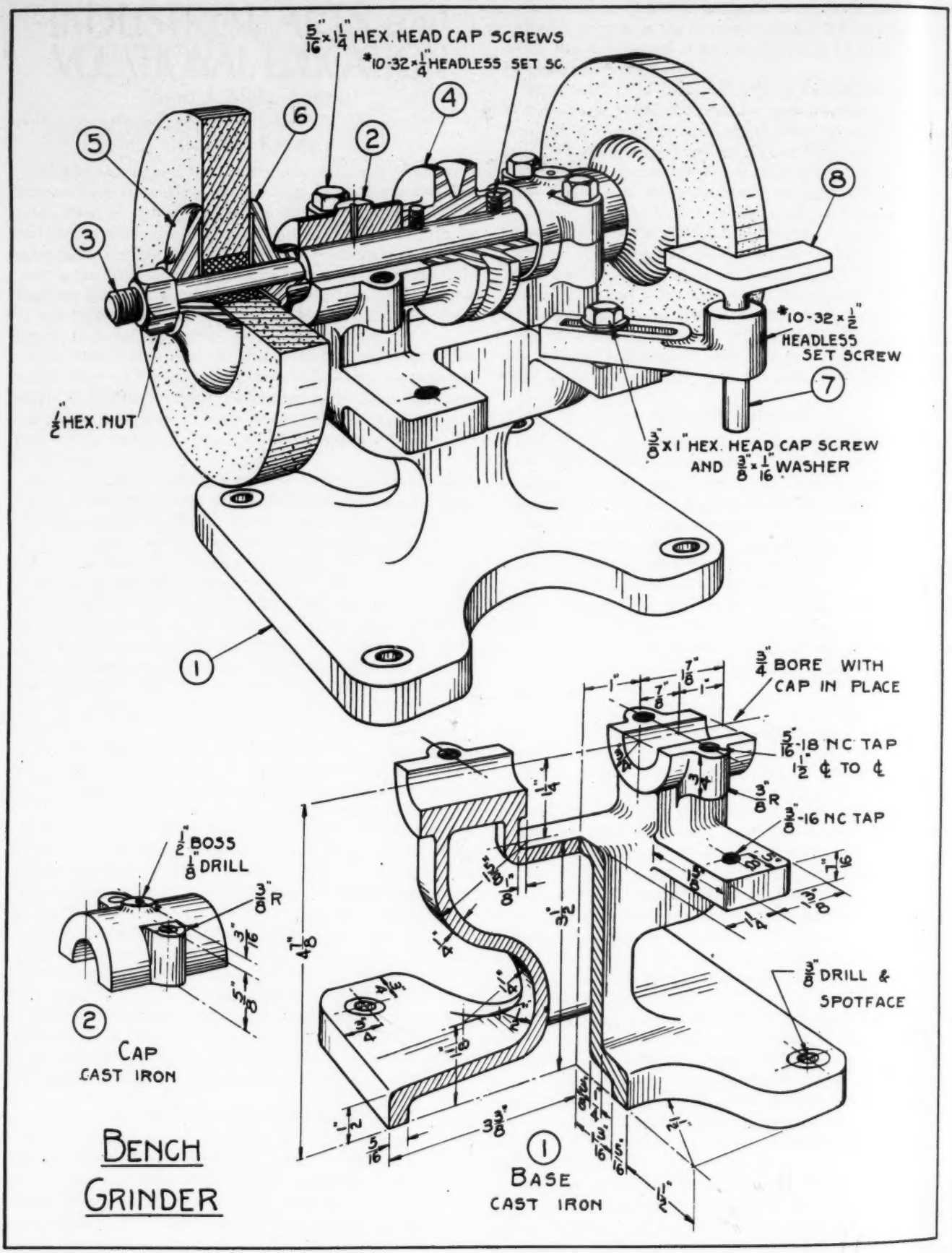
Gutzon studied art in San Francisco, Paris, and London. Since 1902 he made New York his home and most of his noted pieces of sculpture are in the United States. Among his best-know pieces are the head of Lincoln in the rotunda of the capitol at Washington; a statue of a seated Lincoln at Newark, N. J.; statues of Philip Sheridan and James Smithson in Washington, and a memorial for the battlefield at Gettysburg.

He is best known of course for his bold attempts at such gigantic undertakings as the confederate memorial on Stone Mountain, near Atlanta, Ga., and the still more colossal memorial group on Mount Rushmore, in the Black Hills of South Dakota. Unfortunately, after Borglum had finished the twenty-foot head of Robert E. Lee on Stone Mountain, differences of opinion caused the committee to dismiss the sculptor and to turn the work over to another man. This memorial is still far from being finished, although it was started in 1905.

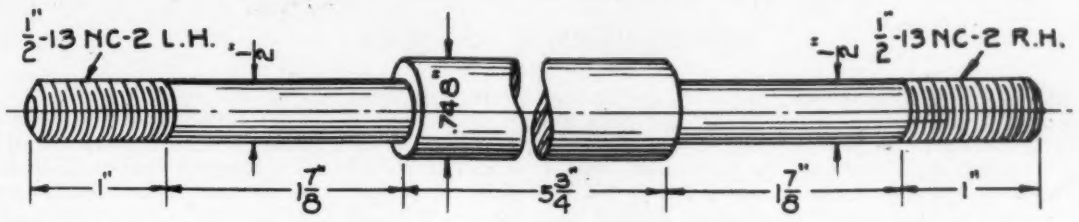
The Mount Rushmore memorial started by Borglum in 1927, consists of 60-foot heads of Washington, Jefferson, Theodore Roosevelt, and Lincoln. It is expected that it will be finished in another month or two. Borglum's son, who has worked with him on the Mount Rushmore group, will no doubt superintend the completion.

Borglum was a great artist, but he also possessed engineering ability, and a thorough understanding of the possibilities which the tools of industry provided. Under him statuary assumed heroic proportions. The sculptor's chisel and mallet no longer were sufficient for the artist. Instead, blasting powder, the air drill, derricks, and hoisting engines were pressed into service to create likenesses which are discernible at a three-mile distance.

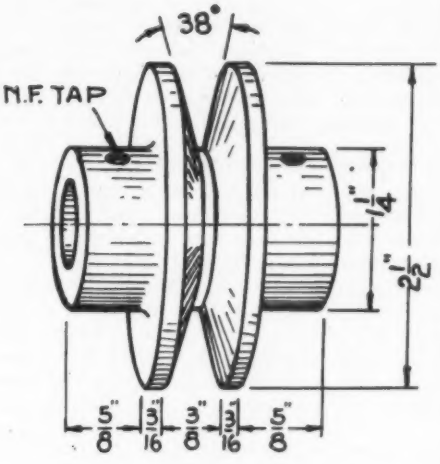
He was an artist who typified our age. To him the term industrial arts really meant a merging of the fine arts with the arts of industry, and he demonstrated in his own works that this merging was conducive to extraordinary results.



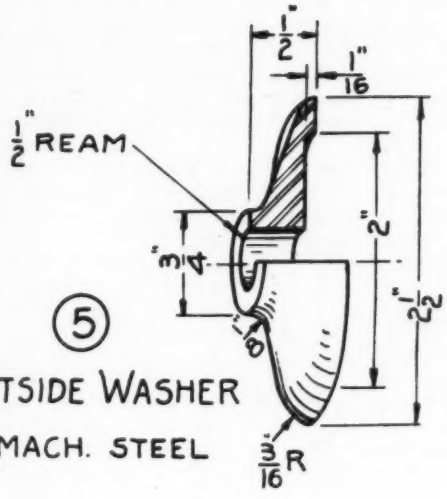
Submitted by W. A. DeVette, Erie Technical High School, Erie, Pa.



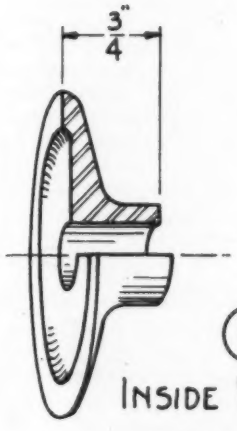
③ SPINDLE
MACH. STEEL



④ V-BELT PULLEY
MACH. STEEL

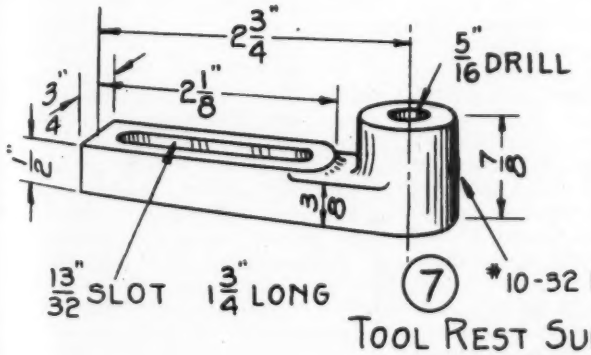


⑤ OUTSIDE WASHER
MACH. STEEL

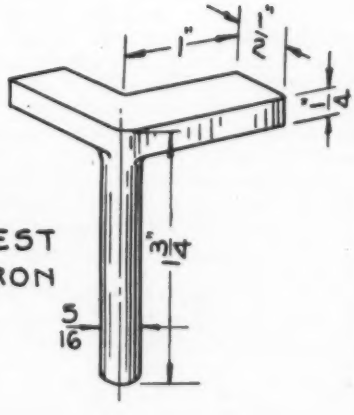


⑥ INSIDE WASHER
MACH. STEEL

BENCH GRINDER



⑦ TOOL REST SUPPORT
CAST IRON



⑧ TOOL REST
CAST IRON

Details of bench grinder by W. A. DeVette. For description see page 168

Trying to Be Somebody Else

DEAN M. SCHWEICKHARD*

Popular Expressions

Human tendencies, if existent generally enough, are likely to find recognition by having some special time or occasion set aside for their observance. There are few who enjoy being the object of a practical joke, but many who like to play a joke on someone else. The first of April has come to be the day when this inclination is most widely practiced, in a more or less good-natured way, but much more universally throughout the entire year many people are being fooled by themselves.

Frequently one pauses to preface a piece of advice or criticism he wishes to give with the expression: "If I were you," or "If I were in your place." The passing implication is that the speaker is, for a moment at least, thinking himself into the being of another. In imagination he temporarily thinks of himself as being somebody else.

The way in which such a thought is expressed has much to do with how it is received. It may carry too much of the attitude that: "If I were you I am sure I could do better than you are doing." On the other hand, it may indicate a real desire to be of help by attempting to comprehend as completely as possible the problem of another in its entire setting.

Among schoolboys one may hear the expression: "Be yourself" or "Act your age," implying that the one addressed is trying to be a different person or a different age than he really is. Sometimes the sudden result is a mustering of one's full and complete physical self and dealing with the offender accordingly. Or if the recipient of the remark is timid he may shrink still further, in his own estimation, and become a much weaker and less significant person than he actually is.

The most healthful reaction of course is to face reality and return sensibly to one's real self. If sufficiently appreciative one might even say on such an occasion: "Thank you for putting me back on the right track."

Occasional Ambitions

Without the ambition to have our skills, our behavior, our possessions, our accomplishments, or our personalities different than they are, there would be little or no progress in human affairs. Mere desire without activity toward the desired end is not productive of progress, and is often more detrimental to the individual than to have no ambitions whatever, for it develops the habit of daydreaming.

Did you ever think of yourself as being president of the United States and picture to yourself what you would do under the circumstances? Or perhaps you have put yourself in the place of some wealthy person you know and followed his way of life in fancy for a time. Instead of a wealthy person it may have been a person whom you looked upon as possessing the power and influence you would covet. If so, have you been able to distinguish between recognizing the qualities or accomplishments of another and dreamily wishing for them or resolving into bitter envy?

At other times, especially in the minds of youth, ambitions may take the form of hero worship. To such the feeling is very vivid, and is usually built around some special attribute, talent, or ability. It may be good looks, strong physique, or special attainment. It is almost always personified in a living person such as a musician, an athlete, a writer, a speaker, a magician, or one looked upon as a general ideal.

Certain unattainable ambitions lead farther from the realm of reality. Occasionally there is a man who spends his life wishing he were a woman, or a woman who wishes she were a man. Now and then an individual is discovered who constantly wishes he were an animal of some sort, depending upon the underlying motives in which he feels thwarted.

Departing still farther from reality, people have been ambitious to be angels or other beings with superhuman power or existence. Fairy tales are evidence of man's desires in this direction, and the delusions of grandeur among insane or semisane people complete the transition into the world of unreality.

Flexibility and Adaptability

Typical of the desire to be, do, or have something different is the story of a woman who lived in a large metropolitan center. The longer she lived in it the more she strove to be almost everyone and everything besides her real self. Finally she came to recognize it as a maelstrom where everyone was trying to be somebody else, and each was trying to keep everybody else from being anybody.

Failure to attain the transitory goals finally prompted her to take up her abode in the open country of the west, where she sought to become, and ultimately became a kind of person hitherto unknown to herself. The secret of the solution lay in the fact that she had been striving to become something which she was poorly fitted to be, but through it all retained her flexibility to meet new situations and adapt herself to them. When she began to confine her efforts to a continuous and consistent pursuit she began to get results which were more satisfactory.

Does this one example mean that we shall all leave the city and rush to the farm or open country? Far from it; there are already too many instances of this sort of emigration. Any sort of wholesale movement for great numbers to do what one individual has done is just another fruitless attempt to be somebody else. Ultimate success lies not in doing just *what* someone else has done, but in observing the method used and adapting it to the fields of one's own abilities. One unsuccessful attempt at self-improvement often results in discouragement and impedes further attempts. It must be remembered that the mistake is not in trying to be someone else, but rather in trying to be the wrong someone.

The Reforming Process

One of the greatest forces in the world to assist people in climbing from what they are to what they may be is organized education. In this respect vocational education probably possesses the greatest amount of potential power, for at every turn it couples human skills and impulses with the world of material things. Failure to grasp this fundamental relationship is at the root of many complete failures in life.

At a time when skilled workers are in demand some people may try to be someone they are not in one of the skilled trades. If this desire is genuine, it must be combined with the willingness to undergo the necessary training or preparation. It is readily recognized that desire or ambition alone is not sufficient to become a doctor, dentist, pianist, violinist, wood carver, surveyor, patternmaker, precision tool operator, architect, machine designer, draftsman, linotype operator, pressman, or nurse.

The procedures toward the goal are those found fundamental in all sound vocational education: (1) take account of our own abilities and disabilities; (2) choose a worthy goal to try for; (3) refrain from enervating, fruitless indulgence in wishful thinking; (4) see that every moment is filled with some progress toward the goal; and (5) create in our own heart as a standard, the kind of person and workman we are striving to become. Through faithful adherence to this procedure, we shall move toward the kind of security that comes from positive accomplishment. If it is to be found anywhere it must begin within one's self.

The one sensible thing to do with a disappointment is to put it out of your mind and think of something cheerful.—*Mark Twain.*

You can never have a greater nor a less dominion than that over yourself.—*Leonardo da Vinci.*

*Assistant Superintendent of Schools, Minneapolis, Minn.

Problems and Projects

BENCH GRINDER

W. A. DeVette,
Technical High School,
Erie, Pa.

(For drawing see pages 164 and 165)

A Unit Problem in Drafting

In selecting problems for drafting classes, it must be kept in mind that the students, have had no contact, in most cases, with either industrial or school shops.

Should the drawing problems given them cover in sequence the principles of drafting as the teacher sees them, regardless of whether such problems have any meaning for the students, or can the same end be reached by a careful selection of problems such as the one shown on pages 164 and 165? The writer has had greater success with the latter than with the former.

Without doubt the student will gather more worth-while related information from such a project than from a group of unrelated, incomplete exercises.

By actual application he will learn the reason for left- and right-hand threads, headless instead of squarehead set screws, running fits, and the value of the oil film in a bearing.

He also will acquire valuable information on design. The steps in making a pattern, and the terms draft, fillets, finish, and cores and core boxes, will begin to have meaning for him. In the same way he may learn about methods of machining and assembling.

Through a thorough class discussion of the problem, the student will gain an appreciation of the work in the pattern shop, the foundry and the machine shop that will more than offset the lack of ordered sequence in the principles of drafting.

VOLTAGE-REGULATOR DEMONSTRATION BOARD

Edward V. Walters,
Wilbur Wright Cooperative School,
Detroit, Mich.

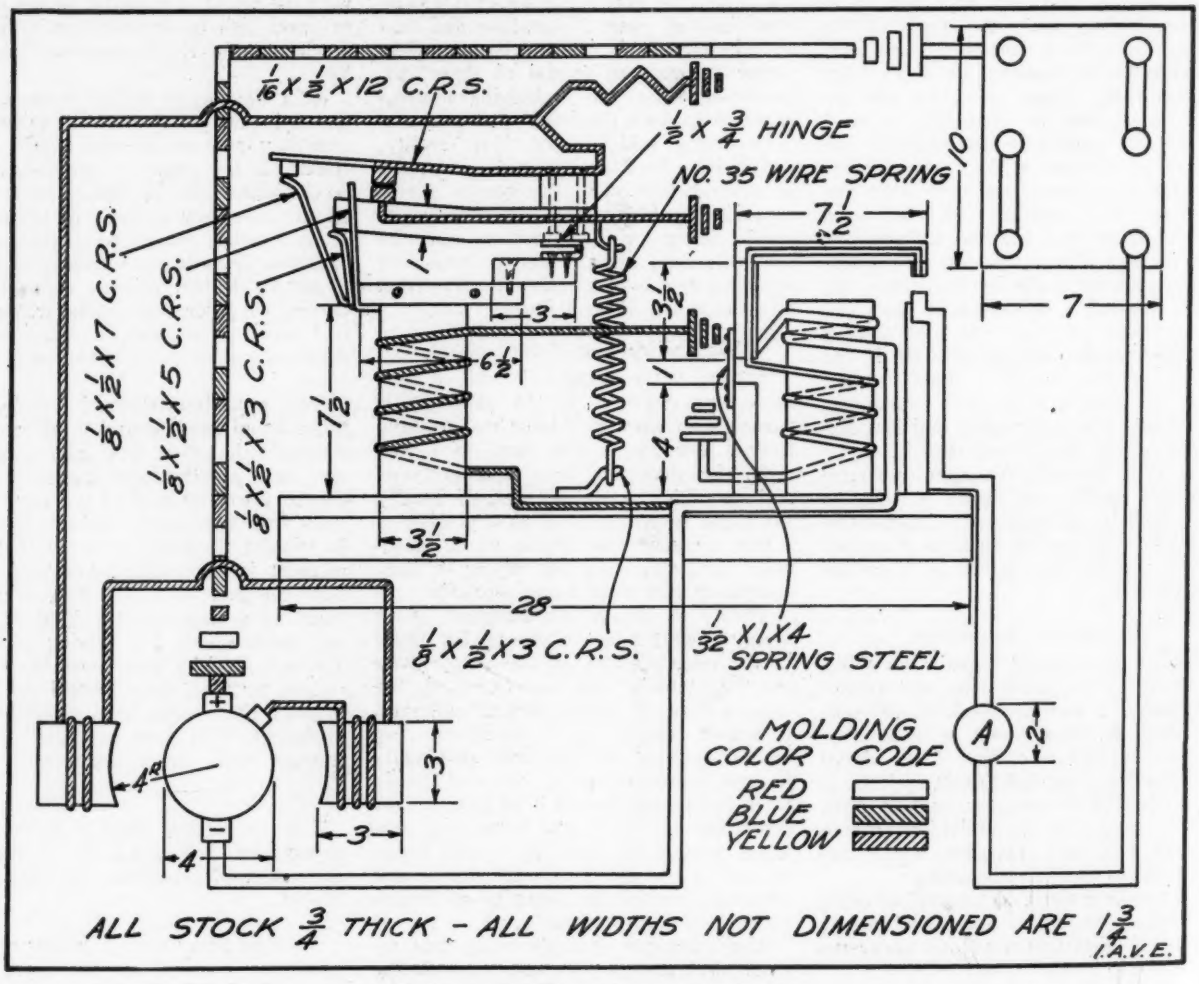
The voltage or voltage-current regulator is a very important unit on the present-day automobile. This is because of the great demand for current from the battery ranging from cranking of the higher compression engines to operating radios, electric windshield wipers, and so on.

A majority of the mechanics coming into our evening trade classes and our apprentice day trade classes in automotive electricity desire information concerning voltage and voltage-current regulators.

The large demonstration model of the step voltage regulator shown herewith is an excellent teaching device, because the various circuits can be easily traced. The mechanical adjustments can be easily demonstrated as per directions given in service manuals, and the demonstration model is large enough so that the changes made may be seen by the entire class. The adjustment stops, for instance, being made of ½-in. width cold-rolled steel.

The entire model is made of ¾-in. white pine for the base, and coil cores and armatures of the cutout relay and voltage regulator, the various parts being mounted on a 3 by 4-ft. piece of ⅜-in. plywood.

The generator armature is 4 in. in diameter and the armature and field coils are also cut



Step-voltage-regulator demonstration board

from white pine ¾ in. thick. The generator-battery circuit wires are made of ¾-in. half-round molding painted red. The generator field circuit wires are made of ½-in. half-round molding painted yellow and the voltage regulator and cutout relay shunt coil windings are made of ⅜-in. half-round molding.

Because of the success in teaching with this board, demonstration models of this type for the vibrating voltage regulator and three-unit type voltage-current regulator are in the process of being made.

SQUARE EASTER CARDS IN LINOLEUM

May Lillian Lampe,
Weehawken, N. J.

When one thinks of Easter time, one instinctively thinks of little white cottontails, fluffy chicks and ducks, beautiful lilies and flowers, and in general the reawakening of nature. New ideas in designing Easter cards are difficult to get, for the field has been very widely developed.

One can find new creations, however, when one studies cards made in the Orient. The Chinese know, for instance, how to put rhythm into their art. They love birds, flowers, and trees. No country can boast of lovelier flowers, or more beautifully laid out gardens than they. They have an appreciation of the value of space in art, hence they never overcrowd. Many very unique ideas can be worked out from their art which are appropriate for Easter. This is especially true of their use of flowers and trees.

The blossoms of the tulip tree or magnolia which is not only popular in this country, but is also much thought of in China, is regarded there as symbolical of candor and purity.

The crocus, this welcome harbinger of spring, with its miniature tuliplike shape and its varied pastel shades, may well be chosen as a flower to decorate an Easter card.

The lily, the symbol of purity and saintliness is, of course, the favorite Easter flower. There are many derivations and varieties of this flower. The daffodil, one of our early flowers, is called Lent Lily in England.

The hyacinth is called a lily by some and a gladioli by others. It was worn by Greek virgins who assisted at a wedding of a friend. Tradition has it that it sprang from the blood of Hyancinthus, the older poets of Greece.

If flowers, birds, trees, or nature's contributions are not what we are seeking for our Easter card, try making a study of stained-glass windows. You will be amazed at the Easter card patterns you may obtain from

some of these windows, with their brilliant colors and variations of light and shade.

Ideas for Easter Cards

Flower and birds, using Oriental influence and Chinese lettering.

Church windows and entrances, using Gothic and Old English modified lettering.

Silhouettes of children (feeding bunnies, ducks, chicks, etc.).

Ecclesiastical — showing religious or angelic ideas.

MAINTENANCE OF HAND FIRE EXTINGUISHERS

The Safety Research Institute of 420 Lexington Ave., New York City, recently gave the following directions for inspecting and recharging fire extinguishers. These directions are very important to teachers of shopwork.

Soda-acid: Recharge annually. If exposed to temperature below 40 deg. F., place in suitably heated cabinets. Do not mix antifreeze crystals with the solution.

Carbon dioxide: Recharge after use; inspect annually to note if seal is intact. Weigh the unit to make certain weight is equal to that stamped on it. Loss of 10 per cent in weight indicates the need for recharging.

Antifreeze, pump tank: Recharge after use; inspect annually to make certain it is filled to filling mark. Test pump action by operating pump for several strokes, directing the stream back into the tank.

DIRECT-READING ELECTRONIC VOLTMETER

Gilbert Oberweiser,

Cedar Rapids, Iowa

By definition, an ideal voltmeter is a potential measuring device that draws no current from the circuit under test. But nearly all voltmeters consume a little current. Some types draw as much as 70 milliamperes for full scale deflection while others require only a fraction of a microampere for operation.

If a power circuit, or any other circuit having a low internal impedance is being measured, it makes no difference whether or not the voltmeter draws a little current. However, any circuit having a high internal impedance is greatly affected by current-drawing voltage-measuring devices. This type of circuit is very common in the fields of radio, communications, electronics, physics, chemistry, etc. In these cases the voltage as read by such an instrument would be much lower than the true voltage. The error may very easily approach 100 per cent.

The voltage of high impedance circuits are generally measured by means of a vacuum-tube circuit which in turn operates a current-drawing instrument, all of which may draw only a fraction of a microampere from the source. This is generally termed as an electronic or vacuum-tube voltmeter.

The main functional difference between an electronic voltmeter and a current-operated voltmeter lies in the fact that the current-operated instrument functions by virtue of the power consumed necessary to move the pointer, whereas the electronic voltmeter operates by virtue of the potential developed across its input terminals. The power necessary to operate the indicating instrument of the electronic voltmeter is taken from within itself instead of from the circuit being measured.

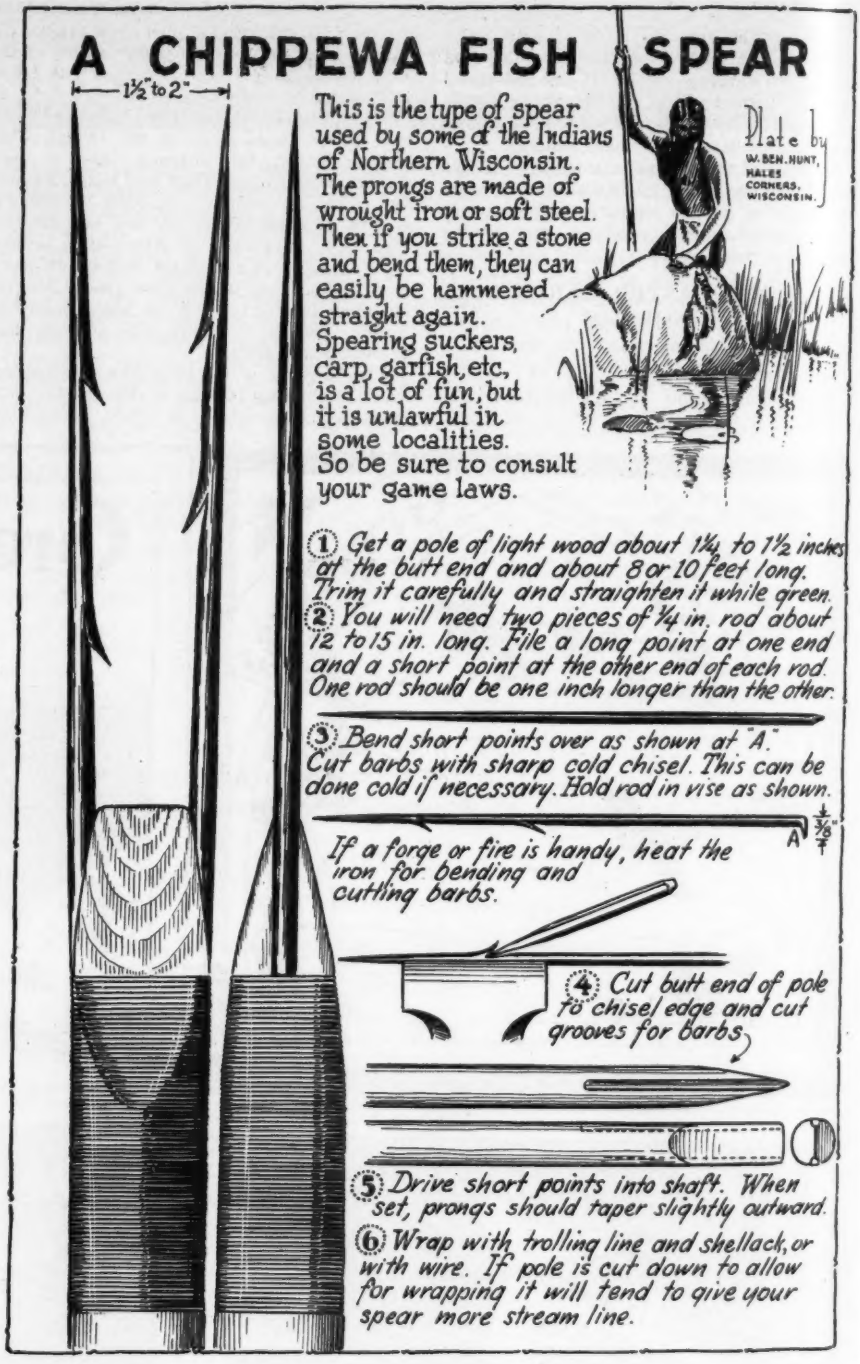
Another characteristic of electronic voltmeters is their ability to function properly over a wide range of frequencies. That is, some of these instruments will measure both d.c. voltages and a.c. voltages ranging anywhere from 30 cycles to 100 megacycles. This quality is rarely found in current-drawing instruments, most of which have upper frequency limits below 10,000 cycles.

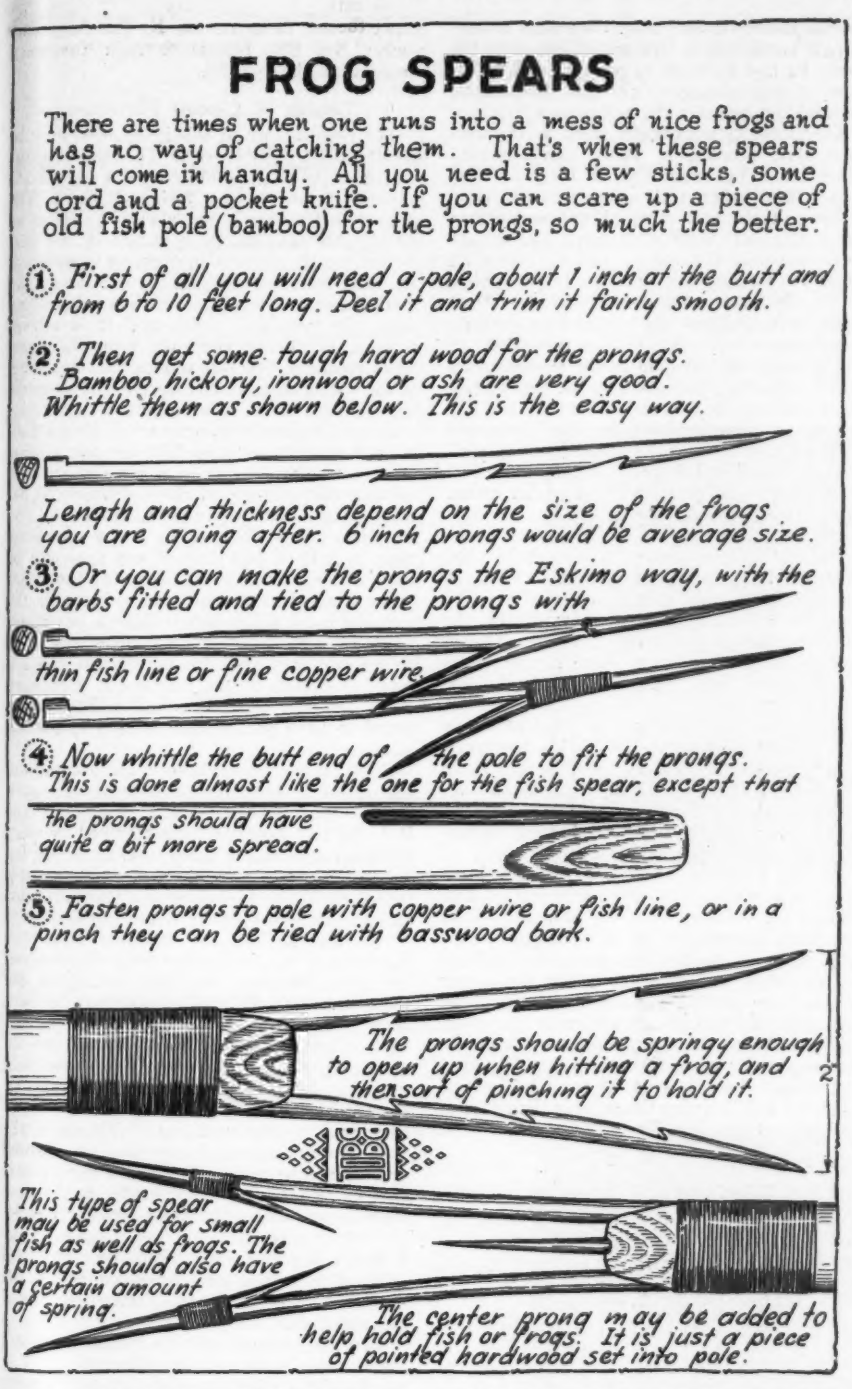
Besides the desirable functional characteristics outlined above, the value of building an electronic voltmeter as a class project is made highly desirable by the fact that the field of application of such instruments is steadily increasing. That is, along with the expanding of the radio and communication fields, vaccum tubes and their associated circuits are beginning to find many industrial applications. This makes it desirable for students to acquaint themselves with such devices.

Electronic Voltmeter Characteristics

Even though electronic voltmeters in general have highly desirable impedance and frequency characteristics, there are many other things to be said about them.

First is the matter of accuracy and dependability. Since this type of instrument is controlled by vacuum tubes its accuracy may depend directly upon the condition of the individual tube or tubes used, which in turn changes with age. This, of course, introduces errors. Another source of error may be due to


A CHIPPEWA FISH SPEAR
1½" to 2"
This is the type of spear used by some of the Indians of Northern Wisconsin. The prongs are made of wrought iron or soft steel. Then if you strike a stone and bend them, they can easily be hammered straight again. Spearing suckers, carp, garfish, etc, is a lot of fun, but it is unlawful in some localities. So be sure to consult your game laws.
Plate by W. BEN. HUNT, HALES CORNERS, WISCONSIN.
1 Get a pole of light wood about 1¼ to 1½ inches at the butt end and about 8 or 10 feet long. Trim it carefully and straighten it while green.
2 You will need two pieces of ¼ in. rod about 12 to 15 in. long. File a long point at one end and a short point at the other end of each rod. One rod should be one inch longer than the other.
3 Bend short points over as shown at "A." Cut barbs with sharp cold chisel. This can be done cold if necessary. Hold rod in vise as shown.
A
If a forge or fire is handy, heat the iron for bending and cutting barbs.
4 Cut butt end of pole to chisel edge and cut grooves for barbs.
5 Drive short points into shaft. When set, prongs should taper slightly outward.
6 Wrap with trolling line and shellack, or with wire. If pole is cut down to allow for wrapping it will tend to give your spear more stream line.


FROG SPEARS
There are times when one runs into a mess of nice frogs and has no way of catching them. That's when these spears will come in handy. All you need is a few sticks, some cord and a pocket knife. If you can scare up a piece of old fish pole (bamboo) for the prongs, so much the better.
1 First of all you will need a pole, about 1 inch at the butt and from 6 to 10 feet long. Peel it and trim it fairly smooth.
2 Then get some tough hard wood for the prongs. Bamboo, hickory, ironwood or ash are very good. Whittle them as shown below. This is the easy way.
Length and thickness depend on the size of the frogs you are going after. 6 inch prongs would be average size.
3 Or you can make the prongs the Eskimo way, with the barbs fitted and tied to the prongs with
thin fish line or fine copper wire.
4 Now whittle the butt end of the pole to fit the prongs. This is done almost like the one for the fish spear, except that the prongs should have quite a bit more spread.
5 Fasten prongs to pole with copper wire or fish line, or in a pinch they can be tied with basswood bark.
The prongs should be springy enough to open up when hitting a frog, and then sort of pinching it to hold it.
This type of spear may be used for small fish as well as frogs. The prongs should also have a certain amount of spring.
The center prong may be added to help hold fish or frogs. It is just a piece of pointed hardwood set into pole.

unsteady supply voltages which furnish the power to operate the instrument. In some circuits the sensitivity and zero setting of electronic voltmeters are critical with respect to their supply.

A source of inconvenience may be due to the nonlinear characteristics of vacuum tubes. This characteristic may require the use of bothersome calibration curves when using the meter, or indicating instruments with special scales may be required.

Fortunately, the difficulties mentioned in the foregoing may be almost entirely eliminated by proper circuit design.

In the meter proposed as a class project, an attempt has been made to combine economical design, simplicity, convenience of operation, and a high degree of dependability. The direct-reading electronic voltmeter proposed here has the following characteristics:

All scales are practically linear, thus no calibration curves for the instrument are required. That is, all voltages can be read directly from the milliammeter as purchased.

The instrument is quite independent of ordinary fluctuations in supply voltage. Tests showed that a 15 per cent change in the supply voltage caused a zero shift of about 3 per cent full scale deflection on the 5 volt scale. No zero shift could be noticed on the higher ranges.

Tests also showed that a 50 per cent change in vacuum tube characteristics will not affect the accuracy or sensitivity of the voltmeter. In other words, after the tube has been in service enough so that it would be considered definitely "bad" or "replaceable" when tested by means of a tube tester, the electronic voltmeter will still indicate voltages as accurately as if a new tube were used.

The effective d.c. input resistance is approximately 25 megohms on all ranges.

The effective a.c. input resistance is approximately 5 meghoms on all ranges.

Theory of Operation

In order to understand how the instrument functions and how the various circuit elements affect the voltmeter characteristics, study the simplified diagram shown in Figure 1. This diagram is used for explanatory purposes only.

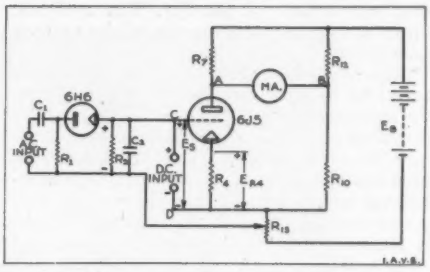


Fig. 1. Simplified diagram of direct-reading electronic voltmeter

First of all, when there is no voltage impressed across the input terminals of the meter, the reading must be zero. Since the indicating milliammeter is connected in a bridge circuit made up of R_4, 6J5, R_7, R_{12}, and R_{10}, the zero setting of the instrument will depend upon the relationship of these resistance values to one another. That is, in order that no current flow through MA, the voltage between points *A* and *B* must be zero. There are any number of combinations of resistors that will satisfy this condition. The combination used, however, is determined by the sensitivity of the instrument and the type of vacuum tube used.

Consider this bridge circuit balanced with no external voltage applied to either input circuit. Now if either an a.c. or d.c. voltage is applied to its respective terminals, a new d.c. voltage will appear between points *C* and *D* with the polarity as indicated.

The voltage thus developed between points *C* and *D* will cause the grid of the 6J5 vacuum tube to become more positive with respect to its own cathode, which in turn has a tendency to make the tube draw more plate current, all of which will upset the balance of the bridge and cause a current to flow through the milliammeter MA.

The voltmeter action just described has been very brief and without reference to sensitivity, stability, or any other particular characteristic.

As was mentioned before, this instrument is not sensitive to supply voltage changes. This is due to the fact that the indicating meter is connected to the supply (E_b) through a Wheatstone bridge arrangement of elements, and as E_b varies from its normal voltage the potential of both points *A* and *B* will theoretically change the same amount, still leaving the potential difference between *A* and *B* unchanged.

The sensitivity of this instrument, that is, the voltage required for full scale deflection of the milliammeter, is greatly stabilized by the series cathode biasing method (R_4 in Fig.

1). This is called "cathode degeneration." This type of stability gives the electronic voltmeter the characteristic of being largely independent of the 6J5 vacuum tube.

Since cathode degeneration is an important factor in the operation of this instrument, and since it is used in many other applications, a brief explanation of how it works may be well worth the while.

If, in Figure 1, due to a voltage being measured, the grid of the 6J5 is increasingly becoming more positive (as it will), then the current through this tube will increase in such a manner that an increasing voltage will be developed across R_4. By the polarities shown in Figure 1, this voltage (E_{r4}) is in opposition to the original disturbance E_s, all of which decreases the effective disturbance between the grid and cathode of the 6J5. This naturally causes a decrease in sensitivity of the vacuum tube circuit.

Since the degenerative voltage developed across R_4 is in the grid circuit, its effect upon the indicating meter (MA) in the plate circuit is multiplied by the amplification factor of the tube. In other words, R_4 connected where it is, produces the effect of a very much higher resistance as far as the plate current sensitivity is concerned. If, then, R_4 is made high enough, it almost completely masks out the internal plate resistance of the 6J5 and makes the sensitivity of the vacuum tube bridge directly proportional to the value of R_4 and quite independent of the 6J5 characteristics. This, of course, increases the dependability of the circuit as a measuring device since resistors of high stability are easily obtained.

The function of the 6H6 diode is that of rectifying a.c. voltages by virtue of the fact that it will pass current in only one direction. C_1 is a blocking condenser to prevent any upsetting of the a.c. input circuit. C_1 also makes possible the measurement of a.c. voltages with d.c. components, such as measuring signal voltages across plate load resistances.

By referring to either Figure 1, or the wiring diagram shown in Figure 2, it will be seen that the a.c. and d.c. voltages are measured through separate terminals but that no other switching arrangement for the change-over is necessary. In order that r.m.s. (Root mean square), a.c., d.c., can be read in such a manner, a definite ratio between R_1 and R_2 must be maintained. Even though this ratio is definite, it is not highly critical. If the ratio between R_1 and R_2 is off 10 per cent a disagreement of approximately 3 per cent between the a.c. and d.c. scales will result.

Thermonic type rectifiers, such as the 6H6 used here, produce a "space charge effect" which must be neutralized if both a.c. and d.c. voltages are to be measured without a shifting of the zero point. This space charge effect manifests itself as a small d.c. voltage (approximately 0.9 volt) occurring across R_2 when no external voltages are being applied to the electronic voltmeter circuit. A voltage equal in magnitude but opposite in polarity that appears across R_{13} cancels this effect.

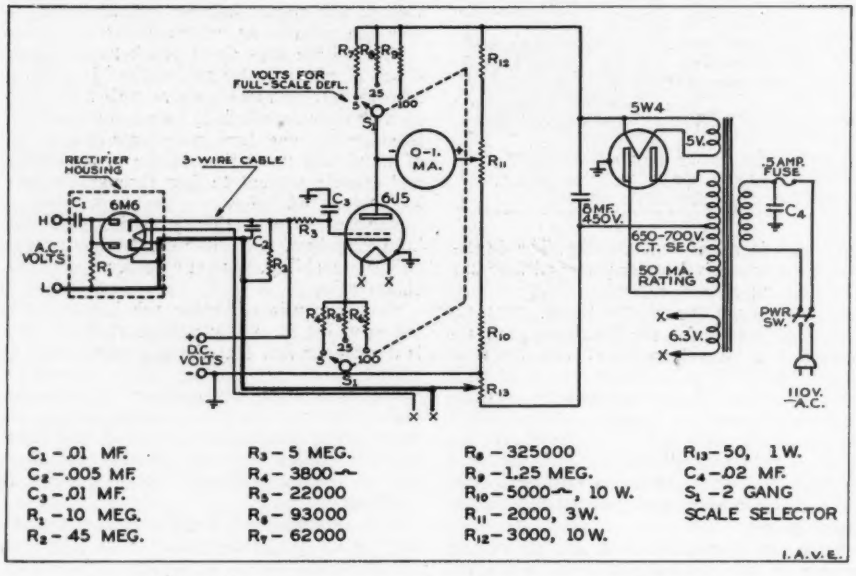
The aging of the 6H6 is not an important factor regarding the accuracy of the instrument, because the load resistances (R_1 and R_2) are so high compared to the internal resistance of the rectifier that ordinary changes in electron emission will have practically no effect upon the rectifying action of the circuit except at very low voltages.

As mentioned before, the electronic voltmeter will be linear enough so that input voltages will be directly proportional to milliammeter deflection and thus can be read directly. There will be a small error, however, on the lower portion of the 5 volt a.c. scale. This is due to the fact that the diode rectifier does not operate very efficiently at such low voltages.

With this type of electronic voltmeter it is not difficult to obtain a very wide frequency range due to the fact that rectification takes place immediately at the input terminals. Because of this, a.c. voltages are converted to d.c. before any attenuation due to stray capacities, inductances, and losses can take place.

If this instrument is to be used for high-frequency work (1 to 50 megacycles), best results are obtained with the construction as specified; however, if the meter is going to be used only at lower frequencies the rectifier circuit may be mounted inside the meter proper, thus eliminating the three wire cable and rectifier-housing construction.

Even though the meter will read accurately on frequencies up to 50 megacycles, the input impedance of the instrument at such high frequencies will be many times lower than that of 60 cycles (5 megs.). This is due to the input capacity and dialectric losses. The Amphenol socket No. SS8 has lower high frequency losses than the No. S8.



C_1 – .01 MF.	R_3 – 5 MEG.	R_8 – 325000	R_{13} – 50, 1 W.
C_2 – .005 MF.	R_4 – 3800 ~	R_9 – 1.25 MEG.	C_4 – .02 MF.
C_3 – .01 MF.	R_5 – 22000	R_{10} – 5000 ~, 10 W.	S_1 – 2 GANG SCALE SELECTOR
R_1 – 10 MEG.	R_6 – 93000	R_{11} – 2000, 3 W.	
R_2 – 45 MEG.	R_7 – 62000	R_{12} – 3000, 10 W.	

I.A.V.E.

Fig. 2. Wiring diagram of direct-reading electronic voltmeter

Choice of Circuit Elements

The performance of this instrument may be greatly affected by the type or make of resistors, etc., therefore, choose to meet the specifications shown on the wiring diagram. The proper choice here is not always a matter of quality, but may be one governed by the particular use the element in question is assigned. In other words, resistors, etc., as sold on the market have definite characteristics depending upon the type and make, and it is advantageous to choose elements with characteristics desirable for the application. Referring to the wiring diagram in Figure 2, the elements wherein this choice is important is as follows:

R_1 and R_2 should be resistors of good stability and should have good high-frequency characteristics. The stability is of some importance because the accuracy of the instrument is dependent upon the proper ratio between R_1 and R_2. However, if R_1 and R_2 are of the same type, a drift of one element will generally be accompanied by a similar drift of the other element, all of which will tend to maintain the constant ratio. Good high-frequency characteristics are also desirable since R_1 is subjected to a.c. voltages and also determines the a.c. input resistance of the instrument. Centralab Type 710 and IRC metalized resistors were found to have good high-frequency characteristics.

Since, as mentioned before, the accuracy of the electronic voltmeter depends directly upon the cathode degeneration resistors (R_4, R_5, and R_6), the best results will be obtained by using precision wire-wound units here. However, because these are expensive, other dependable types such as precision and semiprecision carbon resistors may be found desirable.

Resistors R_7, R_8, and R_9, have very little effect upon the accuracy of the instrument, but they determine the zero setting of the meter such that different zero settings for each scale must be made if these units are not exact. Precision type carbon resistors are the most desirable here. If exactly the same zero setting is desired for all three scales, it may be wise to make R_7 into two units, one 60,000 ohm fixed resistor, and one 10,000 ohm variable. The variable unit may then be adjusted until the same zero setting is found for the 5 and 25 volt scales. No difficulty was experienced in obtaining the same zero for the 25- and 100-volt scales.

R_{10} to R_{13} inclusively should be wire-wound units. The carbon resistor R_3 is not at all critical; values anywhere between 4 and 7 megs will do.

The condenser C_4 offers a means of grounding the electronic voltmeter through the supply line. This eliminates the necessity of using an external ground connection to avoid picking up stray voltages due to electrostatic and magnetic fields.

Mechanical Construction

For the most part, the electronic voltmeter described here is not critical in regard to its mechanical construction. The exception to this, however, is the rectifier housing.

When any voltmeter is used at very high frequencies, the lead wires from the point of measurement to the instrument must be very short if serious errors due to the capacity and inductive effect of these leads are to be prevented. Thus it has become common practice to locate the input circuit of such electronic voltmeters at the end of a flexible cable in as

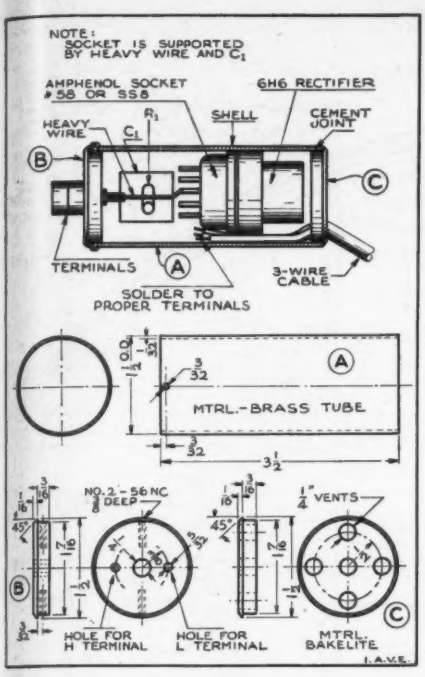


Fig. 3. Rectifier housing details and assembly

small a housing as possible. By means of such construction the user can generally locate the input housing directly at the point of measurement instead of using long leads.

The details of construction and assembly are shown in the drawings. As can be seen, the input terminals, resistor, condenser, socket, 6H6 tube, and cable are assembled in one compact unit first; then the shell is slipped over the assembly and screwed to the front piece. The metal shell should be connected to the low side input terminal. This can be done by extending a little piece of spring material from the *low* terminal so that it touches the shell when put in place.

Operating Instructions

Before the voltmeter is ready for service, a few simple adjustments must be made. First the variable resistor R_{13} must be adjusted to balance out the space charge effect of the diode. This is done by first shorting the d.c. input terminals and adjusting R_{11} so that the indicating milliammeter reads zero. Then after the short is removed from the d.c. input, R_{13} is adjusted until the milliammeter reads zero again. Now the instrument will have a common zero for both a.c. and d.c. measurements.

If R_7 has been made variable, this resistor can now be adjusted so that the instrument has the same zero for all scales.

R_7 and R_{13} should be mounted in a place where they are not likely to be tampered with after being once adjusted.

To utilize the grounding effect of C_4 most effectively, the plug should be inserted in the power line in such a way that the condenser is connected to the grounded side. This can be determined by grasping the rectifier cable. If the meter shows a slight deflection, reverse the plug.

The electronic voltmeter is now ready for operation and can be checked by operating it in parallel with a voltmeter known to be correct. The complete apparatus can be built for prices ranging between $11 and $35, the particular cost being dependent upon the quality of parts, and upon how and where they are purchased.

A ONE-MAN FISHING SKIFF OF PLYWOOD

Claude William Horst,

Milwaukee School of Vocational and Adult Education,

Milwaukee, Wis.

This 8-ft. fishing skiff is very light, but it is unusually strong, since its bottom, sides, transom, and seats are made of waterproof plywood, and the entire job is screw fastened. It is easily transported from place to place on a trailer, or in a cradle on top of a car.

The Building Horse

Construct the horse accurately according to the drawing shown in Figure 1. All the material used should be of fair quality, and all the pieces must be straight, so that an accurate job will result. The entire horse may be made of standard 1 by 8-in. stock. However, it is better to make the stiffener piece and the end pieces of heavier stock as indicated in the illustration, and in the material list. The ends, to which the stem and the transom are attached, must have the same angle as the bow and the stern of the skiff. The whole structure is screw fastened with No. 7 by 1½-in. screws. Figure 2 shows the horse ready for use.

The Stem

The stem is made of two pieces, the inner and the outer stem. Both of these should be made of oak. The piece for the inner stem should be 8 or 10 in. longer than the finished stem. Shape it accurately according to the stem detail drawing shown in Figure 1. Cut

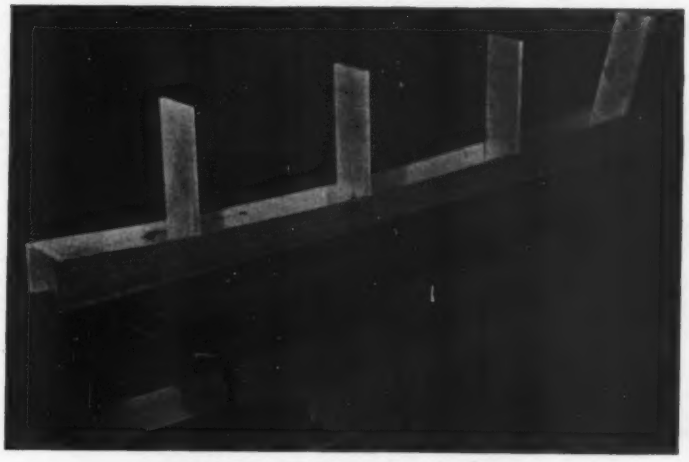


Fig. 2. The horse ready for use

The construction procedure is very simple and few tools are required. The skiff is built right side up on a sturdy assembling horse which holds the structural parts of the skiff rigidly in place during the building process. The whole structure may be moved about, or even set on end, during the building process without in any way disturbing the skiff.

the batten notches and attach the stem to the horse with two ¼-in. bolts. Figure 3 shows this assembly.

The Transom

On the transom stock, lay out the transom according to the dimensions given on the transom details in Figure 1. Cut ½ in. on

Fig. 3. The stem, the transom, and the other frames set in place

the outside of the layout line to allow additional stock for beveling. Set a T bevel to the correct angles and finish the transom ends. Reset the T bevel to make the correct angle with the transom and the bottom. Bevel the three cheek pieces to fit, and cut the batten notches as shown in the transom details

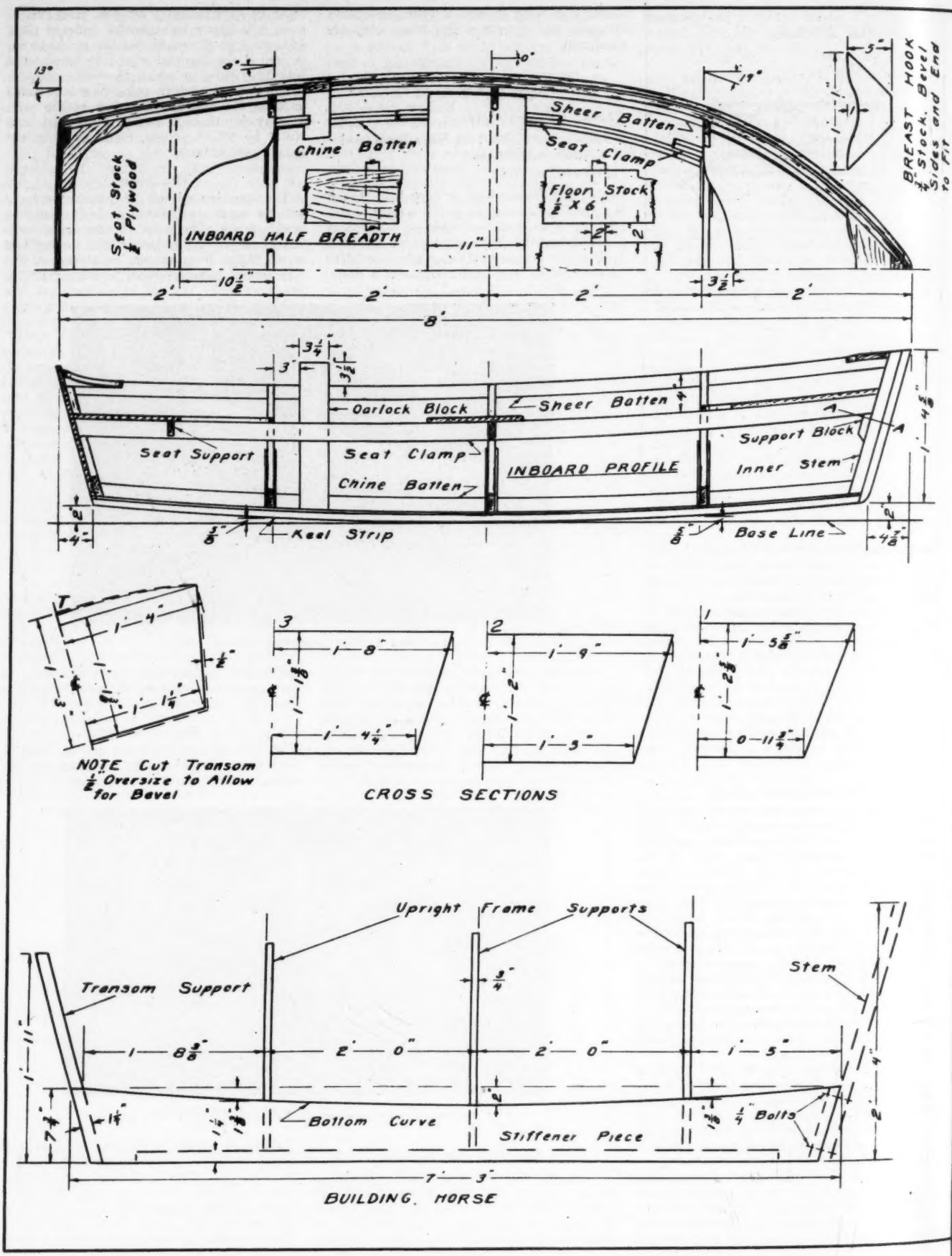
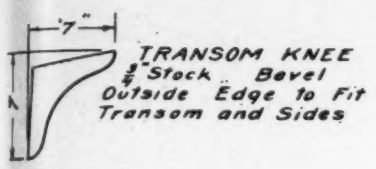
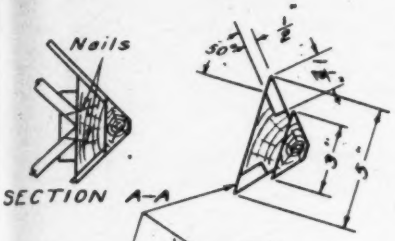
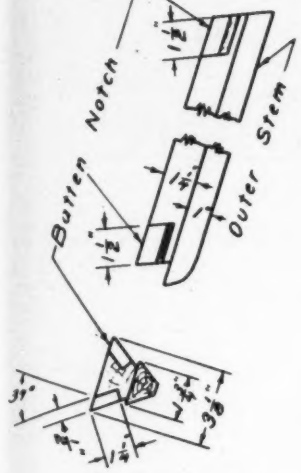
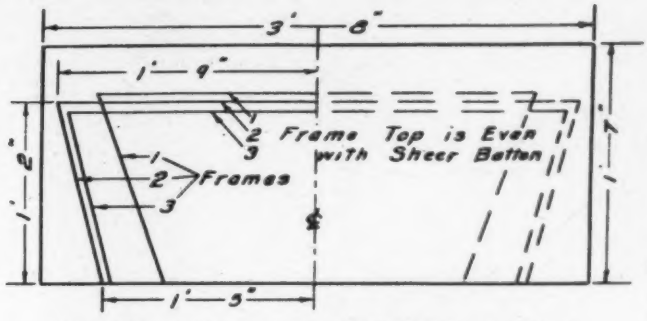


Fig. 1. Eight-foot utility skiff

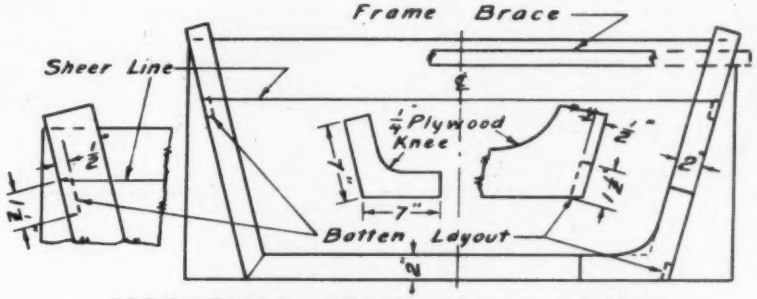






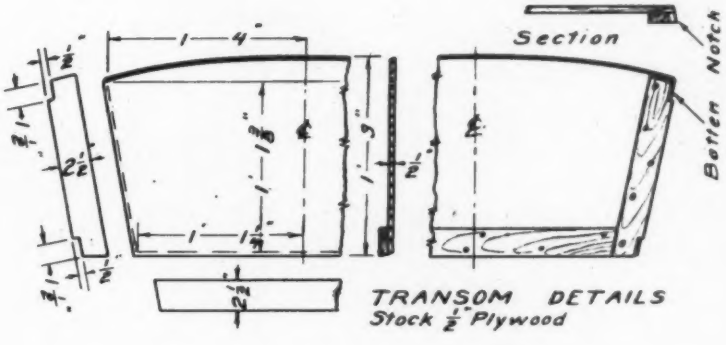


FRAME LAYOUT on PLYWOOD PANEL
Stock $\frac{1}{4}$"

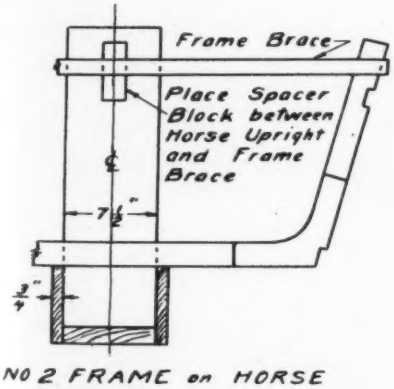


ASSEMBLING FRAME NO 2 on PANEL
Stock $\frac{3}{4}$"X 1$\frac{3}{4}$" or $\frac{3}{4}$"X2"

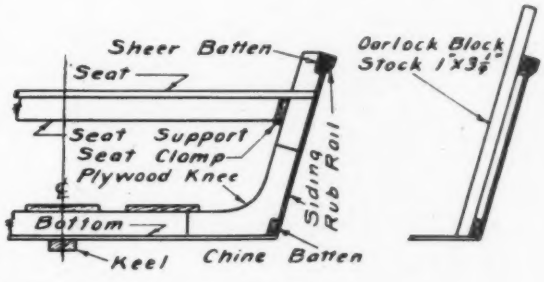
NOTE Use $\frac{1}{2}$"X1$\frac{1}{2}$" Stock for Sheer and Chine Battens. Use $\frac{1}{2}$"X 2$\frac{5}{8}$" Stock for Seat Clamp. Use $\frac{1}{4}$" Plywood for Sides and Bottom.



TRANSOM DETAILS
Stock $\frac{1}{2}$" Plywood



NO 2 FRAME on HORSE



CROSS SECTION

in Figure 1. Attach first the side cheek pieces to the transom with casein glue and No. 7 by 1⅜-in. screws. Then add the bottom piece in the same manner. Attach the transom to the horse with two No. 6 by 1¼-in. screws. See Figure 3.

Frames

All ribs should be made of ¾ by 1¾-in., or ¾ by 2-in. stock, except frame No. 1, which should be ¾ by 2¼ in., because so much stock is cut away in beveling. Ribs should be cut about 4 in. longer than the actual rib length given on the cross sections shown in Figure 1. The bottom cross members are cut exactly to the length shown. The ribs and the bottom cross members are cut to make a miter joint where they are attached to each other as shown in the assembling panel details drawing in Figure 1. The joints for frames 2 and 3 are identical and can be laid out with the same T-bevel setting. Frame No. 1 is slightly different and requires an individual T-bevel setting.

To assemble the frames accurately, lay them out on a plywood panel as shown in Figure 1. They are laid out according to the dimensions given for the cross sections in Figure 1. The dimensions are given only for frame 2, which serves to illustrate the procedure. When the others are laid out in the same manner, the panel is ready to use.

Frame No. 2 is used to illustrate the method of laying out the bottom cross members and the ribs. Set the T bevel for the miter joints and lay off the proper lengths on the stock. Mark the joints with the aid of the T bevel and cut the ends. Mark and cut the angle for the bottom ends of the two ribs. Place the bottom cross member on the panel as shown and attach it with small nails. Place the ribs in position along the frame 2 line on the panel. If the joints are satisfactory, attach them to the panel with small nails. Make a knee template of cardboard. This template is used for all knees for frames 2 and 3. The angle for frame 1 is different so it requires its own template. Place the template on ¼-in. waterproof plywood, and mark around it. Cut two for each joint. Attach the knees to the frames with casein glue and brads, then add eight No. 7 by 1-in. screws at each joint as shown. Next fasten a temporary brace across near the top of the ribs. Mark the sheer and the chine batten notches and cut them out. Frames 1 and 3 are assembled in the same manner. Since frame 2 has no bevels, the brace may be attached to either side. Frames 1 and 3, however, have beveled ribs and the cross members are slightly beveled. The rib bevels are given in degrees as shown just above the inboard half-breadth plan in Figure 1. The bottom angle is small and can be approximated closely by taking T-bevel settings just mentioned. Bevel frames 1 and 3 according to the angles given above the half-breadth plan. It must be remembered that frame 1 has slightly less bevel at the chine than it has at the sheer. After the bevels have been made accurately, mark out the notches for the sheer and the chine battens. These notches must be made at the proper angle as shown in both the half-breadth and the profile views in Figure 1, so that these battens will fit perfectly at all frames. Mark the center line on the horse uprights and fasten a spacer block on the frame side of the horse uprights to which the frame brace will be attached as shown. Place the frames in position, No. 1 with the bevel forward, and No. 3 with the bevel aft. Attach them to the uprights with No. 6 by 1½-in. screws, one through the brace and one through the bottom cross member. Figure 3 shows all frames in position.

Chine and Sheer Battens

The chine and the sheer battens are made of ½ by 1½-in. pine of very good quality so they will take the necessary bend with ease. Cut the aft ends of the chine battens to fit and then clamp them in place, starting at the transom and working forward to the stem. Hold them against the stem covering the notch and mark them. The front ends can be cut off without removing the battens; simply allow the battens to spring back during the process. Attach the battens with No. 6 by 1¾-in. screws. Fit the sheer battens in the same manner but do not attach them permanently until after the front and aft seats have been fitted.

Seat Clamps

Attach a clamp support block to the stem with two No. 7 by 1¼-in. screws as shown in the profile inboard drawing and in Section AA, Figure 1. The exact length of the seat clamps may be found by using two flexible battens ¼ by 1 in., the combined length of which is some 4 ft. longer than the skiff. Mark the bottom edge of the clamp on the transom and all ribs, then tack the battens to the ribs so that their lower edges are even with the marks just made. One batten must be butted against the transom and the other against the stem so that it rests against the clamp block. Now clamp or tack these two flexible battens together where they overlap. This gives the correct length of the seat clamp. Remove the batten from the boat framework and mark out the length of the clamp. Add the two bevels to each end and cut the angles. Attach the seat clamps to the transom and the frames with No. 6 by 1¼-in. screws — two at each place of contact. Attach them to the stem with two small nails as shown in Section AA. Figure 4 shows the complete framework ready for fitting the front and aft seats.

Front and Back Seats

Remove the sheer battens and lay out the seats considerably oversize. Cut the inner curve of both seats and cut out the frame notches accurately. Bevel the front seat to fit the stem and the aft seat to fit the transom. Allow some surplus material at both ends. Locate the seats in their proper places on the structure and replace the sheer battens using clamps to hold them, and mark the ends of the seats to fit the sides of the skiff. Also mark the correct position of the seat clamps on the underside of both seats. Loosen the clamps holding the sheer battens, remove the seats and cut the ends slightly oversize. Since the position of the seat clamps has already been marked on the underside of the seats, drill holes for the fastening screws there between the lines. Fit and attach the aft seat support to the seat clamps. Replace the seats in position and attach them to the clamps with three No. 6 by 1¼-in. screws at each end.

Fig. 4. The framework ready for fitting the front and aft seats

Fig. 5. The sides are then attached to the sheer and the chine battens

The sheer clamps can now be attached permanently. Use No. 7 by 1½-in. screws, one at each contact point. With the aid of a straight stick some 20 in. long, held in a perpendicular fore and aft position against the sheer and the chine battens, the final fitting of the seats may be completed with a plane. Test frequently by moving the stick over the seat edge in the position just indicated.

The Sides

To avoid wasting material a template of wrapping paper should be made. Secure a sheet some 10 ft. long and attach it to the chine and the sheer battens with thumbtacks. Mark the top edge of the sheer and bottom edge of the chine battens, and also the angle of the stem and the transom. Remove the paper and cut along the lines just marked. The side pattern is then ready to be laid on the ¼-in. waterproof plywood siding stock. Cut the sides a little oversize and then trim them off after they have been securely attached to the framework. Before attaching the sides to the framework, apply cold resin glue to both sides of the bare wood of all seams and contact surfaces.

Clamp the sides in position and attach them to the chine and the sheer battens with No. 6 by ⅞-in. screws, spaced 4 in. apart on the chine and 6 in. apart on the sheer. See Figure 5.

Fig. 6. With frames removed, the boat is turned upside down

The Bottom

Trim off the bottom outside edge of the chine battens so they are flush with the which hold the skiff to the horse. Slide the skiff sideways until the stem clears the front of the horse and the whole structure can be lifted off and placed upside down on a couple of sawhorses, or boxes, or some other support as shown in Figure 6.

Fig. 7. Top view of finished boat

bottom cross members. Cut off the bottom of the stem so it will be even with the bottom of the chine battens. If *limber holes* are desired put them in at this stage. They should be about 5/16 by 1 in. However, they are of little value in a skiff as light as this one. Place the bottom stock on the skiff and mark the shape of the sides on it. Cut it a little oversize and later trim it off even with the sides. Apply the glue as directed for the sides. Tack the bottom in place with a nail at each end, and then attach it with No. 6 by 1¼-in. screws spaced about 4 in. apart. Attach the keel strip with No. 7 by 1¾-in. screws.

Outer Stem

Trim off the sides and the keel even with the inner stem and shape the outer stem as shown in the stem detail drawing in Figure 1. Apply glue as suggested for the sides and attach the stem with three No. 10 by 1¾-in. screws. A ½-in. metal oval-shaped nose piece should be attached to the stem for protection. Use No. 6 by ¾-in. screws for this.

The Rub Rail

Shape the rub rail and attach it with No. 7 by 1¼-in. screws. Place the screws about 10 in. apart.

Floor

Turn the boat over and fasten the bottom to the keel piece using No. 6 by ⅞-in. screws placed between the frames and 8 in. apart. Use ½ by 6-in. stock for the floor as shown in the inboard half-breadth drawing in Figure 1. To facilitate cleaning the boat the floor should be removable. Therefore make it in two sections, joined under the center seat. For additional strength and to hold them in place these half-length floor slats are attached to transverse pieces cut to fit between the boat frames and to rest on the chine battens. The fastenings are No. 6 by 1-in. screws.

Oars and Oarlock Blocks

Shape the oarlock block as shown and attach each one with four No. 8 by 1¾-in. screws, two at each end. Secure a pair of 6½-ft. ash oars.

Finish

Check the job for any rough spots and do the necessary sanding. When the boat is ready, give it at least four coats, inside as well as outside, of some good marine paint or varnish. Allow at least 24 hours between each coat. Figure 7 shows the top view and Figure 8 the side view of the completely finished job.

(For bill of material see page 178)

Breast Hook and Transom Knees

Shape and fit the breast hook and knees of ¾-in. hardwood. Attach them with No. 7 by 1½-in. screws using three at each contact surface.

The Center Seat

Remove the brace from frame No. 2. Back the screws out of No. 2 upright frame support and remove it from the horse. Shape and fit the seat of ½ in. by 11-in. plywood. Shape and fit the seat support brace of ¾ in. by 2-in. stock and fasten it to the No. 2 frame with a finishing nail at each end. Fasten the seat in place with No. 6 by 1¼-in. screws, two at each end, and several in the seat support piece.

Detaching the Skiff from the Horse

Remove the bolts which attach the stem to the horse. Take out all the fastening screws

CREDIT GLADLY GIVEN

The brass table lamp, brass bowl, two sets of brass candle holders, picture, and round candy dishes shown in the illustration on page 6 of the January INDUSTRIAL ARTS AND VOCATIONAL EDUCATION were cast, machined, and spun in the in the high school shop of Point Pleasant Beach, N. J. Earl C. Elkinton is the instructor of this school shop.

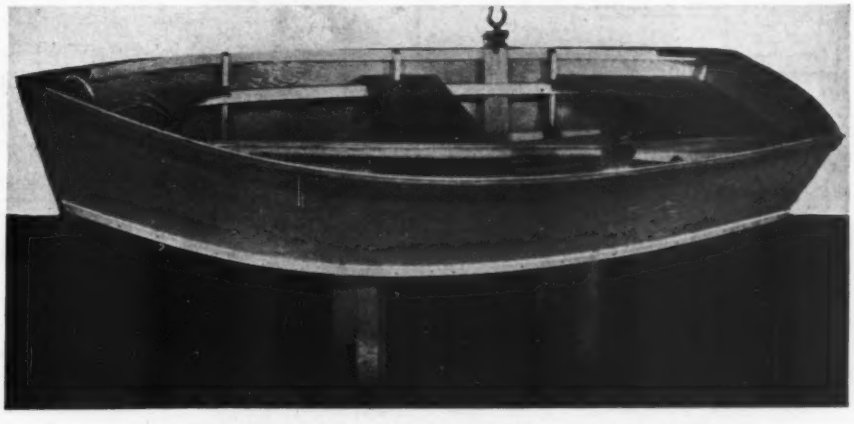


Fig. 8. The skiff ready for a trip to the best fishing ground on the lake

Material List for the Horse

No. Required	Name	Material	Size
1 pc.	Sides	Pine	¾ by 7½ in. by 15 ft.
1 pc.	Uprights	Pine	¾ by 7½ in. by 7 ft.
1 pc.	Rest of horse	Pine	1¼ by 7½ in. by 8 ft. 6 in.

Material List for 8-Ft. Skiff

No. Required	Name	Material	Size
1 pc.	Breast hook and transom knee	Oak	¾ by 5 by 36 in.
1 pc.	Stem, outer	Oak	1 by 3 by 20 in.
1 pc.	Stem, inner	Oak	1¼ by 5 by 28 in.
1 pc.	Transom	Waterproof plywood	½ by 16 by 36 in.
1 pc.	Seat, front	Plywood	½ by 24 by 36 in.
1 pc.	Seat, aft	Plywood	½ by 24 by 36 in.
1 pc.	Seat, center	Plywood	½ by 12 by 40 in.
2 pc.	Sheer battens	Pine	½ by 1½ in. by 10 ft.
2 pc.	Chine battens	Pine	½ by 1½ in. by 9 ft.
2 pc.	Seat clamps	Pine	½ by 2¼ in. by 9 ft.
1 pc.	Ribs, No. 2 and 3	Pine	¾ by 1¾ in. (or 2 in.) by 6 ft.
1 pc.	Ribs, No. 1	Pine	¾ by 2¼ in. by 3 ft.
1 pc.	Bottom cross members (all of them)	Pine	¾ by 1¾ in. (of 2 in.) by 8 ft.
1 pc.	Siding	Waterproof plywood	¼ by 36 in. by 10 ft.
1 pc.	Bottom	Plywood	¼ by 36 in. by 8 ft.
1 pc.	Keel strip	Pine	¾ by 1¾ in. by 8 ft.
2 pc.	Oarlock blocks	Oak	¾ by 3¼ by 18 in.
2 pc.	Rub rail	Pine	½ by 1½ in. by 10 ft.
2 for each joint	Frame knees		Enough of the ¼-in. plywood will be left.
3 pc.	Floor	Pine	½ by 6 in. by 6 ft.

Fastenings for Skiff and Horse

No. Required	Name	Size
½ doz.	Screws	⅝ in. No. 5 f.h. brass
1 gross	Screws	⅞ in. No. 6 f.h. brass
2 gross	Screws	1 in. No. 7 f.h. brass
2 gross	Screws	1¼ in. No. 6 f.h. brass
½ doz.	Screws	1¼ in. No. 7 f.h. brass
2 doz.	Screws	1⅜ in. No. 7 f.h. brass
1 gross	Screws	1½ in. No. 7 f.h. brass
1 doz.	Screws	1¾ in. No. 7 f.h. brass
2 doz.	Screws	1¾ in. No. 8 f.h. brass
1 lb.	Nails	6d
2 only	Bolts	¼ in. by 3-in. carriage

CORRECTION

Unfortunately the cuts for Figures 5 and 6 on page 73 of the February, 1941, issue of INDUSTRIAL ARTS AND VOCATIONAL EDUCATION were printed upside down. They should have appeared as shown here.

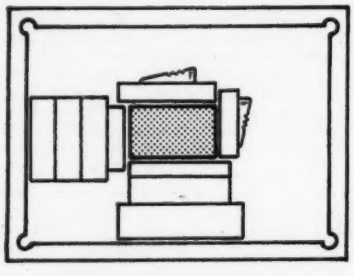


Fig. 5

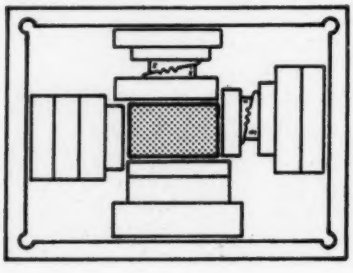


Fig. 6

AN AIRPLANE-PROPELLER BOAT

John Claude, Jr.,
Milwaukee, Wis.

The airplane-propeller model boat shown herewith was designed and made by an eighth-grade airplane fan who wanted to know whether the propeller from an airplane would not also furnish motive power to a boat.

The one shown in the illustration worked so well that all of his friends are now making similar boats, and they have great fun arranging races between individual boats of a fleet which now number quite a variety of models.

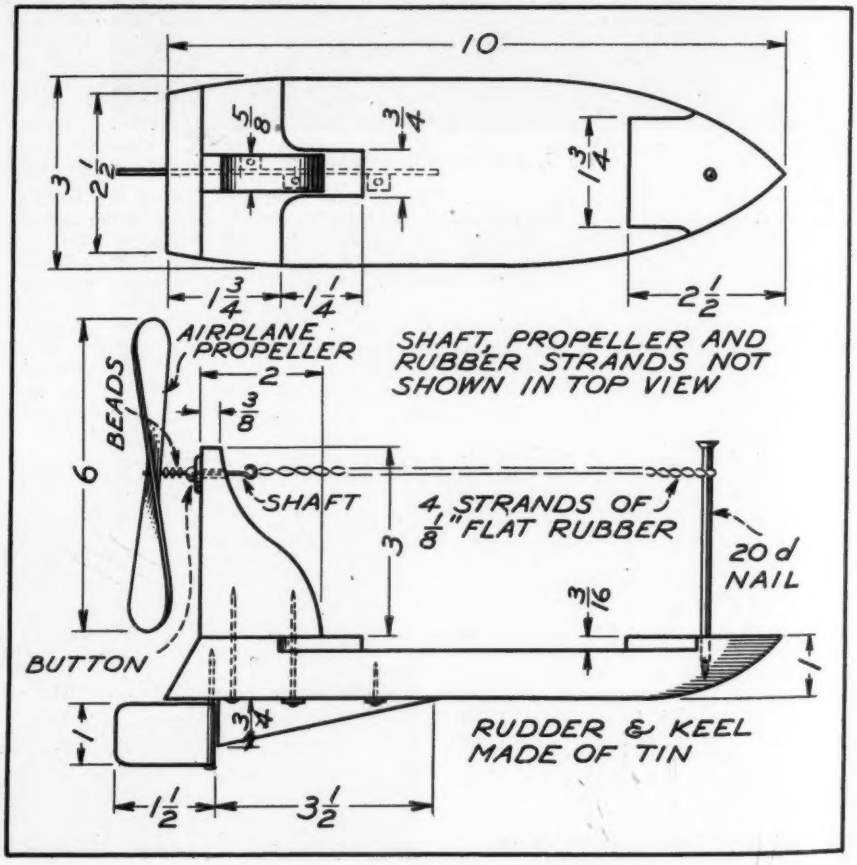
PERSONAL NEWS

ADVANCEMENT WELL EARNED

Philip L. McNamee, Industrial Co-ordinator for the Chicago Board of Education since 1926, was elected to the position of assistant superintendent of schools in charge of vocational education on February 7, 1941.

(Continued on page 14A)

Philip McNamee



Airplane-propeller boat designed by John Claude Jr.

FAR SEEING Atlas engineers started a new chapter in machine tool history when the first Atlas Lathe was introduced. It was the first practical low-cost precision metal lathe. It was the first time the fine new tough metal alloys were used for lathe parts, the first time precision production methods were used in lathe manufacture.

TODAY Atlas Lathes, Shapers, Milling Machines, Drill Presses are rapidly changing production ideas in many plants. Modern production engineers have discovered that Atlas Equipment can be used for machining countless small parts that formerly tied up larger expensive machines. And as Atlas Machine Tools are constantly improved to handle new industrial operations, their exceptional values continue to increase for vocational educators who select these tools of industry to train the new workers in industry. Atlas Press Company, 471 N. Pitcher Street, Kalamazoo, Michigan.

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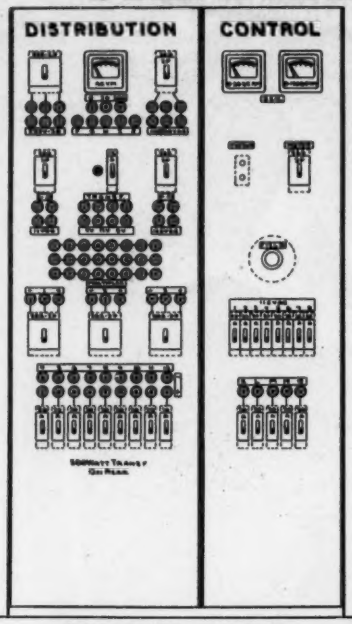


CONTROL BOARD
For small electrical shops where limited budget is available. An inexpensive type, but it provides the flexibility necessary.

Instruction in electricity, to meet the immediate and increasing demand of the National Defense Program, is greatly facilitated by the installation of STANDARD TEST AND DISTRIBUTION PANELS. These units allow for all types of installations necessary to meet every instructional requirement, ranging from elementary electricity to advance adult work.

FLEXIBILITY OF EQUIPMENT

These panels are designed to be low in cost, pleasing in appearance, in keeping with modern trends, and made in types that provide maximum circuit and operating flexibility, speed in changing connections, and are sturdily constructed to withstand hard usage.

STANDARD TEST AND DISTRIBUTION PANELS are designed and constructed for all branches of electrical instruction in industrial arts shops, vocational and trade schools, and technical high schools.

ENGINEERING SERVICES AVAILABLE

By engineering and furnishing STANDARD equipment in hundreds of institutions our experienced field engineers have accumulated data from all parts of the country vital and valuable to schools contemplating equipment for electrical instruction. We offer, without obligation, the services of these engineers to assist in developing practical layouts to meet every instructional requirement.

WRITE FOR BULLETIN NO. 109. This Bulletin includes complete information on STANDARD TEST AND DISTRIBUTION PANELS with associated equipment. Layouts and illustrations of equipment in the small school shop, as well as in the technical high and vocational school shop, are shown. Write for your copy.

THE STANDARD ELECTRIC TIME COMPANY
SPRINGFIELD, MASSACHUSETTS BRANCH OFFICES IN PRINCIPAL CITIES

(Continued from page 178)

The vocational program of the Chicago public schools has become outstanding through the relationship established between employers and labor organizations brought together by Mr. McNamee, working with superintendent of schools, Dr. William H. Johnson. The result of this relationship is shown by the two thousand apprentices attending the Washburne Trade School receiving wages for school time.

Chicago was one of the first school systems in the country to set up a defense program. Dr. Johnson recommended the appointment of Mr. McNamee as director of national defense. Getting to work at once, Mr. McNamee had the classes in operation in three high schools, eight days after word was given to start operations. In the meantime, the work has grown to include eight of the largest high schools of the city, without interfering with the regular school program.

Mr. McNamee brings to the administrative position of assistant superintendent, a full understanding of the demands placed upon a vocational teacher as well as the opportunities presented to him.

Under the leadership of Dr. Johnson and Mr. McNamee, the future of vocational education in Chicago is bright indeed.

♦ CHARLES F. ZINN, formerly head of the department of printing at the Camden County Vocational School, New Jersey, began his duties as vocational teacher trainer in the industrial education department of Pennsylvania State College on January 17, 1941. Mr. Zinn has had a broad educational background as well as considerable practical experience in industry.

♦ R. R. HAYES has succeeded Mr. Charles F. Zinn as head of the department of printing at the Camden County Vocational School, New Jersey.

♦ H. V. SHEPHERD, drafting teacher at Mechanic Arts High School, St. Paul, Minn., has been forced to resign because of illness. RALPH E. SMALLEY has been chosen to take his place.

♦ C. K. REIFF, who had resigned as superintendent of Oklahoma City schools, Okla., to become a teacher at the William Jennings Bryan school for crippled children, has been appointed to the vocational department of the state board of education in connection with the rehabilitation of physically handicapped children.

♦ THOMAS L. HANKINS, teacher trainer, Trade and Industrial Education at the University of Kentucky, Lexington, has issued a selected list of technical and vocational books which may interest teachers engaged in the National Defense Training Program. The subjects covered are aviation, automotive, electricity, machine-shop practice, sheet-metal work, and welding.

♦ E. A. T. HAPGOOD, superintendent of schools, Mount Morris, N. Y., recently was reappointed as superintendent for the seventh consecutive year. Prior to his work in Mount Morris, Mr. Hapgood served 16 years on the administrative staff at Albany, N. Y., as director of vocational education and principal of the Albany Industrial High School.

ASSOCIATION NEWS

AMERICAN INDUSTRIAL ARTS ASSOCIATION

A well-organized series of nine leadership conferences on industrial-arts education comprised the programs of the American Industrial Arts Association in Atlantic City, N. J., on Friday and Saturday, February 21 and 22, and on Monday and Tuesday, February 24 and 25.

Most impressive of all was the 8-page program, in which were included a "Statement of Purposes," a "Preface to a Program," and the list of fourteen professional releases of 1940.

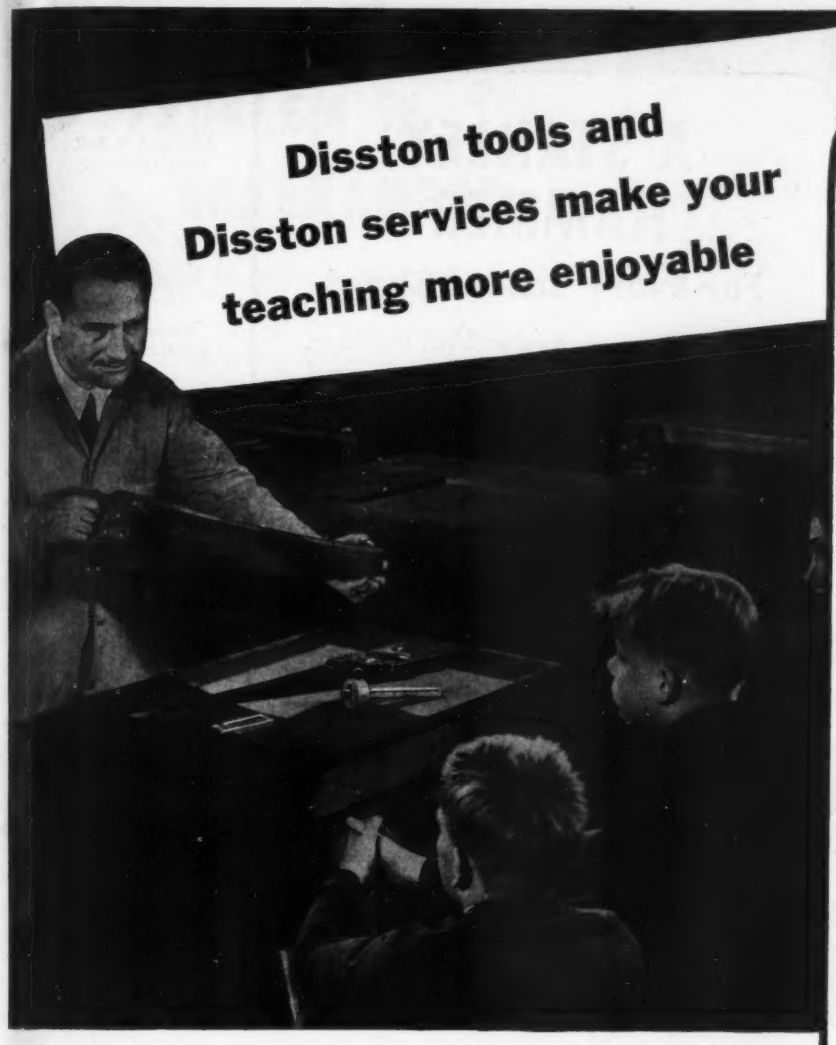
The conferences opened with a series of two caucuses concerning major policies of the association. These were followed by a constitutional convention, which resulted in the adoption of a constitution and a vote to incorporate.

Next there was a conference on local, county, and district programs of industrial-arts teachers. This was followed by a conference of state and regional association programs of industrial-arts teachers, which opened with a keynote address by Clifford K. Lush of Minneapolis, last year's president of the Minnesota Industrial Arts Association and which was participated in by a panel of experienced state leaders composed of Robert A. Campbell of Trenton, N. J.; Morris P. Cates of Portland, Me.; Elmer W. Christy of Cincinnati, Ohio; Romeo E. Collin of Chittenden, Vt.; Everett J. McIntosh of Weymouth, Mass.; Louis V. Newkirk of Chicago, Ill.; Harold G. Palmer of Cedar Falls, Iowa; and J. Ely Van Hart of Elizabeth, N. J.

One of the most interesting sessions of all was the annual conference on industrial-arts teacher education, which was presided over by Dr. John R. Ludington of the State College at Raleigh, N. C. A "Directory of Industrial Arts Teacher Education Programs and Personnel in the United States" was distributed for review. This is to be published as one of the major professional releases of the association in the 1941 series.

A distinguished panel then discussed "The American Industrial Arts Association and Teacher Education." The members of this group included President Karl L. Adams of the State Teachers College at DeKalb, Ill.; Prof. C. Blair MacLean of the State Teachers College at Fitchburg, Mass.; Prof. Fred O. Armstrong of the State Teachers College at Trenton, N. J.; Prof. Arnold M. Hess of the State Teachers College at Newark, N. J.; President Edward S. Maclin of the New River State College at Montgomery, W. Va.; Dr. Burl N. Osburn of the State Teachers College at Millersville, Pa.; Prof. Augustus C. Phillips of the State College at Ettrick, Va.; Dr. William D. Stoner of Miami University at Oxford, Ohio; and Prof. Gordon O. Wilber of the State Normal

(Continued on page 16A)



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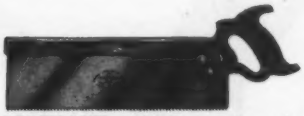

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Whether you teach woodworking, plumbing, bricklaying – electrical, automotive or metal work – you'll find there's a Stanley hammer that just fits your needs. A hammer you can count on for longer life under rough use because its head is tempered by an exclusive process which strengthens the grain structure of the steel to its full potential – because its straight grain, "Evertite" hickory handle is oil treated to prevent shrinkage and assure a tight head.
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Machinist's Ball Pein Hammer
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Machinist's Riveting Hammer
Trimmer's Tack Hammer
Auto Body and Fender Bumping Hammer

(Continued from page 14A)

School at Oswego, N. Y. President Marvin S. Pittman of the Georgia Teachers College at Collegeboro, Ga., summarized this conference.

At the annual president's luncheon on Monday, Dr. William E. Warner informally discussed the subject of "Organizational Orientation and Need." Allen D. Backus of Newark, N. J., then presented the certificates of affiliation in what may also prove to be an unusually interesting annual event.

At the joint luncheon with the art department of the National Education Association on Tuesday, Prof. John J. Hatch of Newark, N. J., presided and Prof. Clara MacGowan of Northwestern University at Evanston, Ill., discussed "Our Contribution to the Core Curriculum of the Secondary School."

At the concluding business session on Tuesday afternoon, February 25, the following slate of officers and Executive Committee personnel were chosen to lead the association: president: Dr. Louis V. Newkirk, director of industrial arts, Board of Education, Chicago, Ill.; vice-president: Elmer W. Christy, director of industrial arts, Board of Education, Cincinnati, Ohio; executive secretary and treasurer: John J. Hatch, 185 Broadway, Newark, N. J.; chairman of the Curriculum Commission: Dr. Heber A. Sotzin, chairman of the department of industrial-arts teacher education, State College, San Jose, Calif.; chairman of the Liaison and Advisory Board: Dr. William E. Warner, professor of education, the Ohio State University, Columbus, Ohio; chairman of the Council of States and Territories: Dr. John A. Whitesel, Teachers College of Connecticut, New Britain, Conn.; chairman of the National Committee on Affiliates and Delegates: Allen D. Backus, director of industrial arts, Board of Education, Newark, N. J.

Following a conference of the Executive Committee, seven curriculum vice-presidents will be appointed and announced, to direct the seven levels of the American program of industrial-arts education announced in the association's statement of purposes concerning programs for the elementary school, the secondary school, social and atypical types, higher education, teacher education for the three degrees, adult and out-of-school types, and federal and federally subsidized types involving industrial arts.

The association now enjoys a membership in every state and territory of the Union, has a number of important affiliates, and has won a permanent place for industrial-arts education in the programs of the National Education Association.

A revised schedule of memberships was adopted, as follows: Active, $1; Associate, $1; Student, 50 cents; Life, $25; Honorary, and Sustaining, $10–$100.

♦ Epsilon Pi Tau's *Thirteenth* Annual National Initiation and Banquet, which was held on Washington's Birthday at the Senator Hotel in Atlantic City, N. J., proved to be another happy and memorable affair, partly because of the number 13. Romeo E. Collin of Chittenden, Vt., president of the New England Industrial Arts Association, discovered what was wrong when not even his friends thought to introduce him at the banquet; so his was the opportunity to point out that there had been *thirteen* people at the speakers' table, *thirteen* initiates, chapters in *thirteen* states, *thirteen* stripes in the Fraternity's new American flag, and that the reception following the banquet was to be on the *thirteenth* floor of the Traymore Hotel. This was too much for Mrs. Arthur F. Hopper of Plainfield, N. J., who delighted everyone by volunteering the information that she was the *thirteenth* child to be born in her family.

The *thirteen* initiates, in addition to Romeo E. Collin (who at first had thought he couldn't come), are as follows: Richards A. Ballou, Providence, R. I., Morris P. Cates, Portland, Me., Charles H. Dilks, Wilmington, Del., Eugene S. Giammatteo, Bristol, Conn., Dwight H. Grant, Hartford, Conn., Roland R. Hintz, New Rochelle, N. Y., H. Clay Houchens, Richmond, Va., Charles L. Kabealo, Columbus, Ohio, G. Wesley Ketcham, Norwalk, Conn., Everett J. McIntosh, State Director of the National Education Association, Weymouth, Mass., Wallace G. Nesbit, Cleveland Heights, Ohio, Richard M. Savage, Gorham, Me., Laurence J. Young, New York, N. Y.

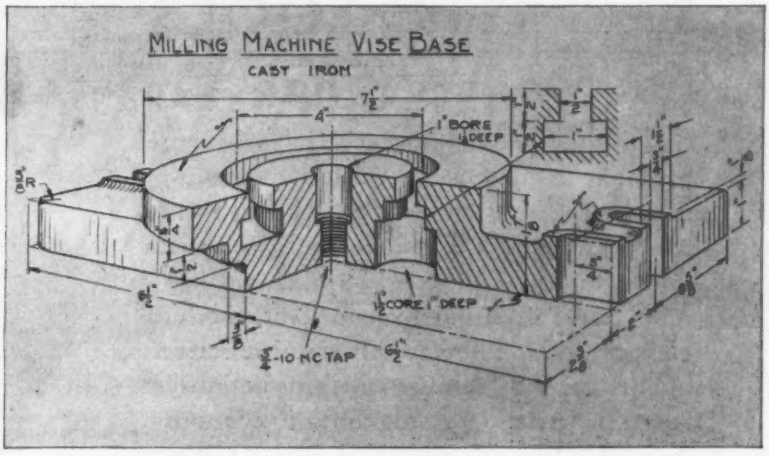
Never has an audience of Epsilon Pi Tau been so stimulated by an address as by that given by Richard F. Bach of the Metropolitan Museum of Art in New York City, on the general subject of "American Industrial Art: Looking Ahead." Mr. Bach has long lived the field of applied aesthetics on an international front, and made distinction after distinction that pleased even the most discerning person present.

Dr. Lawrence F. Ashley, chief of the Division of Vocational Education, Board of Education, Yonkers, N. Y., presided at the banquet, and John A. Backus, director of education for the American Type Founders Sales Corporation of Elizabeth, N. J., presented the Fraternity with a beautiful motorized American flag.

The initiating team of states consisted of Dr. John R. Ludington, State College, Raleigh, N. C.; Prof. C. Blair MacLean of the State Teachers College, Fitchburg, Mass.; Prof. Harold G. Palmer, State Teachers College, Cedar Falls, Ia.; Ralph L. Newing, manager of the Educational Department of the International Textbook Co. at Scranton, Pa.; Prof. Gordon O. Wilbur, State Normal School, Oswego, N. Y.; Crawford C. Sinclair of the High School at New Brunswick, N. J.; Prof. Wayne P. Hughes, State Teachers College, Charleston, Ill.; and Dr. William E. Warner of the Ohio State University, Columbus.

Among the distinguished guests at the banquet were President and Mrs. Karl L. Adams of the State Teachers College at DeKalb, Ill.; President H. D. Welte of the Teachers College of Connecticut at New Britain; Dr. Ernest Kent, director of industrial arts for Jersey City; Dr. Lucille Allard, director of elementary industrial arts at Garden City, N. Y.; Everett J. McIntosh, state director of the National Education

ANOTHER PROBLEM IN REARMAMENT



PROBLEM: Ask your students to draw the correct orthographic views of this milling machine vise base.

SOLUTION: For your convenience Dixon offers a free blueprint showing the problem's solution. Write to address below for blueprint No. 128—J4.

Building to exact specifications is a "must" in the rearmament program. It is also a "must" in the manufacture of Dixon's *Typhonite* Eldorado drawing pencils. *Typhonite* Eldorado leads must be smooth even in the hardest degrees—they must be uniform throughout the entire range of 17 degrees—they must be strong to stand up under pressure, even when sharpened to the finest point—they must make lines whose opacity and evenness guarantee the perfect blueprint.

These rigid specifications are met by creating a new form of graphite in a process exclusive with Dixon. This is the *Typhonite* process in which natural graphite is battered in a typhoon of super-heated steam until the new form emerges—*Typhonite*. *Typhonite* particles are minute, even and controlled in size.

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Association, Weymouth, Mass.; Dr. Carter Alexander of Columbia University; and Dr. Paul Sloan of the State Teachers College at Buffalo, N. Y.

The Fraternity's next national initiation and banquet will be in connection with the National Education Association convention in Boston on Monday evening, June 30, 1941, when Dr. Francis T. Spaulding, dean of the Graduate School of Education at Harvard University, will be the speaker.

♦ The New York State steering committee for industrial arts is part of the New York State Vocational and Practical Arts Association. Meetings are held previous to the annual conventions, with an additional meeting in the Spring. Syracuse, N. Y., is the meeting place for most of these meetings.

In the above picture, the persons shown at the speakers' table, reading from left to right, include: Prof. C. Blair MacLean of Fitchburg, Mass.; Prof. John J. Hatch of Newark, N. J.; directly in front of whom is Laurence J. Young, director of shop work in New York City; Allen D. Backus, director of industrial arts in the Newark, N. J., public schools; Dr. William E. Warner of Columbus, Ohio; Miss Adams, who is president of the New Jersey Education Association; the speaker, Richard F. Bach of New York City; Dr. Lawrence F. Ashley of Yonkers, N. Y.; John A. Backus of Elizabeth, N. J.; Romeo E. Collin of Chittenden, Vt.; Prof. Harold G. Palmer of Cedar Falls, Ia.; and Prof. Wayne P. Hughes of Charleston, Ill.

Membership in this body is by elected delegation. The industrial-arts men of the state are banded together in clubs, and each of these sends a delegate to the steering committee. There are at present about 30 organizations represented. Also on the steering committee are the state supervisor of industrial arts and the sectional vice-presidents of the New York State Vocational and Practical Arts Association.

The steering committee maintains a clearinghouse which distributes materials contributed by the clubs, such as plan sheets, bibliographies, book lists, related lessons, club-news sheets, and other pertinent material. The clearinghouse is entirely supported by membership fees from the various clubs.

Projects to be completed or partially completed this year include: studies of teacher training, both undergraduate and graduate, a public-relations program, awards to teacher-training college students and also high school students, and the development and publication of contributed materials through the clearinghouse. It is expected that the results of the committee on "The Philosophy and Policies of Industrial Arts" will be ready for publication before the end of the year.

The officers for this year are: Jerome F. Wilker, Hamburg, chairman; William Becker, Ithaca, vice-chairman; Vincent Bannigan, Utica, treasurer; Irving Peters, Locust Valley, L. I., secretary; Edward Roden, Syracuse, chairman, clearinghouse.

♦ The Industrial Arts Teachers' Association of Newark, N. J., have elected the following as officers for the coming year: Daniel E. Verniero, president; Thomas V. Guidera, vice-president; Leonard C. Johnson, treasurer; Howard G. Stintsman, secretary.

The board of governors consists of the officers and Jerome B. King, William B. Mayer, and Robert B. Strahan.

D. E. Verniero, president of the organization, spoke on "The City Program of Industrial Arts" at the convention of the American Industrial

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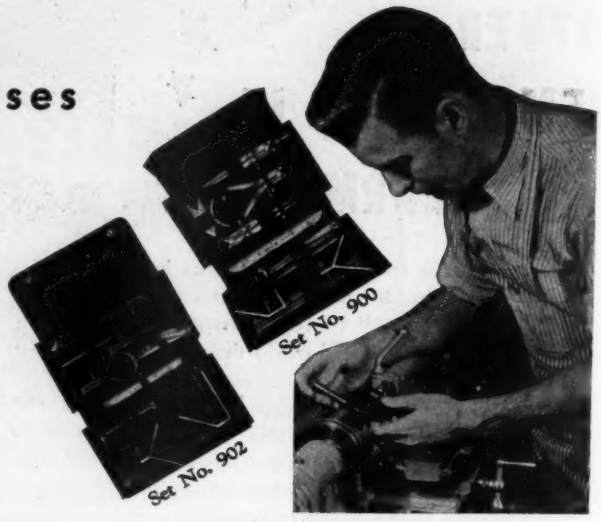
Let these Starrett Student Kits solve the problem of adequate precision tool equipment for your shop classes. These kits are based on wide experience with industrial educational needs. They contain the tools rated most essential for work on modern class projects. They are all genuine Starrett quality for long service and satisfaction yet low in price for maximum economy. Available through your tool dealer. Write for Starrett Catalog 26-CE.



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Standardize on

New York State Steering Committee
First row, left to right: Sam Cramblett, Roy G. Fales, Geo. E. Schultz, Albert Truman and Jerome F. Wilker
Second row: John Pikus, Francis Lynch, Vincent Bannigan, Courtney Newstead, Wm. Becker and Edward Roden
Standing: Herbert Lidstrom, Floyd Miller, Bernard Swift, Glendon Seaman, David Meade, Irving Peters, Ralph Fraser, Carrol Scriber and E. Stanley Moore

Arts Association at Atlantic City, N. J., held on February 24, 1941.

The Newark industrial-arts teachers are working on a continuous program of research and evaluation of curriculums. Such a program has stimulated inquiry and has fostered professional growth. — *Howard G. Stintsman.*

♦ The Pacific Arts Association will hold its 1941 Convention in Portland, Ore., April 7, 8, and 9.

The theme of the convention is *The Place of Art in Life*. The aim of the convention is to find out how all the activities of the school community can be made useful to the art teacher, in addition to the more prevalent procedure by which the art teacher is effectively used by those in related studies.

The principal speaker will be Prof. Hilda Taba of the staff of the University of Chicago, for the past five years engaged in evaluation study under the General Education Board.

Officers of the association this year are: president, Robert Tyler Davis, director of the Portland art museum; vice-president, Esther Wuest, supervisor of art in the Portland Public Schools; secretary, Ruth Halvorsen, art teacher in Lincoln High School, Portland; treasurer, J. Leo Fairbanks, on the faculty of Oregon State College at Corvallis, Ore. — *Virginia B. Strong*, Publicity Secretary.

♦ The February meeting of the Westchester Industrial Arts Club was held at the new Harrison High School, Harrison, N. Y., on Friday, February 14. Eugene Ricke, director of industrial arts for the Harrison Schools, acted as host. He held open house in his shop and made it possible for the club members to tour the new building. Edward Fuller, Paul Fuller, and Charles Tries, are associated with Mr. Ricke as shopmen in the Harrison Schools.

After visiting the building, Dr. Ralph E. Pickett, associate dean of the School of Education, New York University, delivered an interesting address on the subject, "After the War; Then What?"

A. A. Gerety, a field representative of the Texas Oil Company, displayed a film entitled "Going Places." — *Herbert F. Lidstrom.*

♦ The New Economic Education will be the subject for the eighth annual Conference on Business Education to be held by the University of Chicago in Haskell Hall (University of Chicago) on June 26 and 27. The conference is an integral part of the summer program offered by the School of Business for teachers interested in securing advanced degrees in the field of business education.

Positive aspects of the approach to business and economic education from the viewpoint of consumer education will be discussed by speakers who are qualified by experience and research to present a true picture of the possibilities of this development.

♦ A meeting of the Worcester County Industrial Arts Instructors was held at Ocean City, Md., on February 1.

(Continued on page 26A)

Latest operating manuals For Delta motor-driven tools

Over Two Hundred Photographs and Illustrations In Each Book

● As pioneers in developing a basically new type of low-cost machine for industry and schools—the Delta Manufacturing Company found a need for specific illustrations of the new and wider ranges of work made possible with this greatly improved equipment. The natural result was a complete series of adequate, up-to-the-minute operating manuals which should be in the possession of every man connected with school shop management and operation.

These books, although nominally priced, contain a wealth of valuable information with numerous photographs, working drawings and explanatory diagrams. They cover every phase of operation and maintenance of all major tools—as well as other subjects of interest to instructors in industrial training. The material is so complete, so accurate and authoritative that some of it is being used unchanged, in the latest standard text books. All books in this series are paper covered of uniform size (6" x 9")—and each volume contains over 200 photographic illustrations and line drawings. You can order any or all of these manuals with the understanding that if they do not measure up to your expectations in every way — they can be returned for full credit.

CIRCULAR SAW AND JOINTER—A complete exposition of the construction and correct operation of the 10" Tilting Arbor Saw and the 6" Jointer including: Ripping; Saw Projection; Use of Moulding Fence; Crosscutting; Miters; Cutting to Length; Resawing; Rabbeting; Tilt Table Operations; Taper Ripping; Spline Grooves; Cutting Curves; Production Work; Pattern Sawing; Cove Cutting; Long Work; Gang Saws; Simple Tenoning Jig. The Moulding Head and its use; the use of Abrasive Wheels, Dado Head, Tenoning Jig—and the making of Common wood joints; the Jointer and its adjustments; Jointer operations—Jointing an Edge; Side Pressure Jointing an End; Surfacing; Rabbeting; Beveling; Taper Jointing; Tapering in the Round; Stop Chamfering; Jointer Kinks and an Appendix of valuable tables—48 pages ..... Price 25c

LATHE—A complete summary of construction and operation of the lathe for wood turning, metal turning and metal spinning, including: Spindle Turning; Faceplate and Chuck Turning; Special Turning Operations; Post Blocking; Oval Turnings; Split Turnings; Turned Boxes; Duplicate Turning; Spiral Turnings; Hollow Spirals; Fluting and Reeding; Use of Lathe attachments; Jigs and Fixtures; Wood Finishing; metal Turning Operations; Spinning Equipment; Methods of Working; Special Spinning Chucks and Appendix Containing Tap Drill Sizes; Polishing Materials; Decimal Equivalents; Table of Taper Cuts; Grinding Angles for Wood Turning Tools; Grinding Angles for Metal Turning Tool Bits; Lathe Speeds—48 pages ..... Price 25c

BAND SAW AND SCROLL SAW—Complete information on band saw blades; Methods of Working including: Ripping and resawing; Use of Standard Fence; The Ripping Blade; Ripping Curves; Tilt Table Operations; Cutting Off with Fence and Gage; Use of Stop Rod; Cut off Block; Using Clamp attachment; Crosscutting Wide Stock—Cutting Circles; Jig Construction; Cutting Glue Blocks; Round Corners; Circular Rails; Sanding; Compound Band Sawing; the Cabriole Leg; Compound-Sawed Turnings; Ornamental Work; Sawing in Multiple; Ripping Thick Stock; Split Dowels; Tapering Jigs; Marking Turning Squares; Pattern Sawing; Beveled Curves Metal Cutting; Construction and Proper Use of Scroll Saw; Scroll Saw Operations; Sanding and Filing; and Appendix of valuable Scroll Saw and Band Saw Tables—48 pages.... Price 25c

DRILL PRESS—A practical encyclopedia of drill press maintenance and operation including Various Methods of Laying Out Drill Press Work; Use of Wood Bits; Sanding Drums and Grinding Wheels; Drill Practice in Wood; Use and Grinding of Twist Drills; Drilling and Tapping in Metal; Routing, Shaping, and Mortising on the Drill Press; Miscellaneous Drill Press operations and special useful ideas for the drill press, with numerous drill press tables covering drill sizes, speeds of operation, drill lubricants—48 pages..... Price 25c

ABRASIVE TOOLS—Covering the operation of the Grinder, Buffer, Belt Sander, Disk Sander, attachments—Explanation of Different Abrasives; How to Sharpen Tools; Grinding Shaper Cutters; Grinding Twist Drills, How to Use Sanding Drums, Cut-Off Wheels; Miscellaneous Abrading Operations; with an appendix on Abrasive Terms and valuable Abrasive tables—48 pages ..... Price 25c

SHAPER—Covering: The Shaper and its adjustments; Cutters and Collars; Methods of Operations; Shaping with guides; with collars—with Patterns; Use of Forms; Jigs and Fixtures; Application of Shaper Cutters; Grinding Shaper Cutters; Appendix of valuable tables—48 pages.... Price 25c

Practical Finishing Methods

● The book that every shopman has been waiting for. Tells in simple easily followed instructions how to do every possible finishing operation—how to prepare the work—how to stain—Oil—varnish—lacquer, etc. Shows proper use of spray gun and brush. Tells how to mix your own low cost materials. Silk screen process—how to finish metal—make decorations. In fact, it's a complete guide on every practical finishing operation giving secret methods developed over many years. 64 pages, profusely illustrated. Price..... 50c

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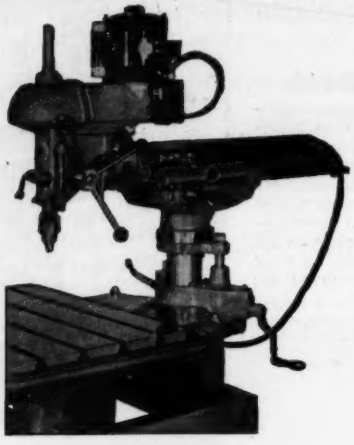
SHOP EQUIPMENT NEWS
New Products—Publications

RADIAL DRILL FOR DRILLING, TAPPING, AND LIGHT PROFILING

Walker-Turner Co., Inc., Plainfield, N. J., announces a new radial drill which has been especially designed as a low-cost tool for such light duty operations as drilling, tapping, routing, and light profiling with speed and accuracy. It is finding wide use in industry and in school shops.



Radial drill

The drill head is mounted on a heavy cast-iron ram which rides back and forth in a supporting cradle on eight precision ball bearings. This permits rapid movement, forward or back, and reduces lost motion to a minimum. The ram can be quickly locked in any desired position with a quarter turn of the conveniently located clamp lock. The drill head can be tilted up to 45 deg. either right or left, and securely locked in position. When the W-T radial drill is rigidly locked in position it operates with a minimum of deflection.

Capacity of the drill is unusually large, drilling to the center of a 62-in. circle. Ram travel is 18 in. Maximum distance of chuck to table is 13½ in. Vertical movement of drill head is 8½ in. and spindle travel is 3¾ in. Capacity of the Jacobs Chuck is ½ in. Over-all height is 72 in., width, 31 in., and depth front to back is 58 in. Shipping weight, 450 lb.

For further information, write Walker-Turner Company, Inc., 602 Berckman Street, Plainfield, N. J.

BLUE-POINT ¼-IN. ELECTRIC DRILL

Built to meet the need for a lighter, easy-to-handle, ball- and needle-roller-bearing tool of ¼-in. capacity for constant production or repair service, this new Blue-Point Drill is compact, streamlined, and modern in every detail and it is light and easy to handle. The pistol grip is centered below the body, and the weight of the tool centered across the hand provides extra convenience. The rear handle is placed at right angles to the pistol grip to give additional control and ease of handling on the tougher drilling operations.

The over-all dimensions of this drill are only 11½ by 3½ in. Its compact shape permits it to be used in places where other drills of the same capacity would be useless.

High-grade ball bearings are used on the armature shaft and chuck spindle and needle roller bearings on the gear shafts. Smooth, powerful torque is provided through a double-reduction gearing. Helical cut gears are accurately machined for quiet operation and long wear. The powerful universal motor is cooled by a balanced

New electric drill

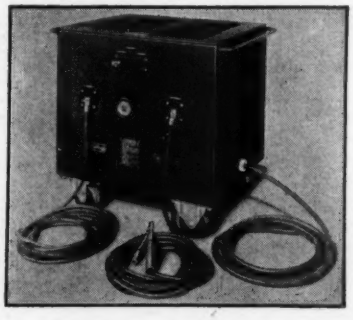
fan mounted on the armature shaft. No-load speed is 450 r.p.m., full-load speed, 300 r.p.m.

Aluminum alloy is used for the die-cast housing to insure ample strength and minimum weight. The drill has a drilling capacity of ⅜ in. in steel and 1¼ in. in hardwood. For further information write Snap-on Tools Corporation, Kenosha, Wis.

JUNIOR WELD-O-TRON ELECTRONIC ARC WELDER

The Allis-Chalmers Mfg. Co., Milwaukee, Wis., has placed their new Junior Weld-O-Tron electronic arc welder on the market.

This unit supplies current as low as 5 amp. and uses electrodes as small as 1/32 and 3/64 in. in diameter. It is especially suited for welding metal in gauge sizes from 32 to 18. It may, however, be used for metal as thick as 14 gauge.



Weld-O-Tron arc welder

This arc welding unit consists essentially of a three tube polyphase mercury vapor rectifier circuit, thus eliminating all rotating parts. It makes use of the company's Actron type of rectifier tubes which have proven very successful. It combines all the advantages of a.c. and d.c. arc welding. It is of light weight and portable, and the controls and terminals are accessibly located on a panel.

NEW BLUEPRINTING MACHINE WITH WASHER AND DRIER

The C. F. Pease Co., 2601 West Irving Park Rd., Chicago, Ill., announces their new "22–16" combination of blueprinting machine with washer and drier. While this machine can be operated at a speed exceeding 20 ft. per minute, nevertheless, it is also possible to use slow-speed blueprint papers which give better and more permanent prints with deeper blue color and greater contrast.

The outstanding features of the printer are: sliding contact, three-speed lamp control, and actinic arc lamps. The washer and drier has the horizontal water wash, quick change chemical applicator, and five 8-in. aluminum drying drums which can be heated either with gas or electricity.

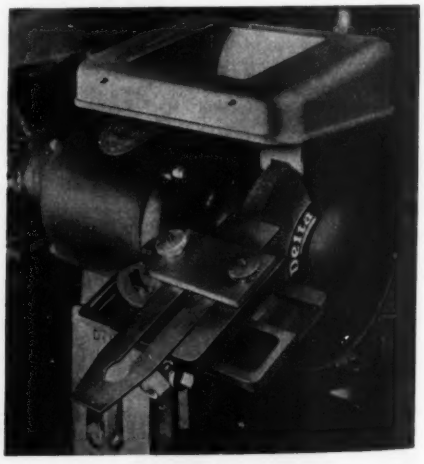
TWO NEW GRINDING ATTACHMENTS

This new drill-grinding attachment developed by the Delta Mfg. Co., Milwaukee, Wis., is a precision-built unit so accurately made, and so easy and simple to operate that anyone can now do a perfect drill-sharpening job. A setting attachment with an accurate scale permits micrometer settings that insure evenly ground lips so that the drills run true. The amount of lip clearance on the drill is just right with enough of the heel cut away to provide enough clearance without weakening the cutting edge.

Drill grinding attachment

An additional feature of this drill-grinding attachment is that anyone can adjust it so that each drill can be ground to fit the job with lip clearance and angles at any degree required. Capacity: 1/8-in. to 5/8-in. drills.

This new plane-bit grinding attachment developed by the Delta Mfg. Co., of Milwaukee, Wis., has a carriage table which is readily clamped to the adjustable arm on the grinder, and tilts so that the desired angle may be obtained. This table is fully machined and on it rides the plane-bit holder and clamp.



Plane-bit grinding attachment

The plane bit is clamped as shown — an adjustable quadrant is located on the left side which permits the accurate grinding of angle knives as well as assuring an accurate right-angle position for straight knives.

A knurled nut below gives hairlike adjustment for the amount of the *cut* when grinding. The entire carriage and clamp may be lifted off the table thus providing a convenient and accurate table for other grinding without the necessity of replacing the regular tool rest. Distance between clamp screws is 3 3/16 in., affording ample space for wide knives as well as scrapers. A diamond-pointed wheel dresser may be clamped into holder alongside the angle quadrant for wheel dressing.

(Continued on page 25A)

(Continued from page 22A)

TWO NEW OFFERINGS BY HIGGINS

"Systematic Color" are the words which best describe the new complete color assortment just launched by Higgins Ink Co., Inc., Brooklyn, N. Y. The 18 colors contained in the assortment are placed in the same order in which they appear on the Higgins Color Card. The color card was designed by Egmont Arens, famed industrial designer. The color card shows the sample chips made with Higgins American Drawing Inks actually applied on white drawing paper. The chips are arranged in a color wheel of eight hues patterned after the highly popular Wilhelm Ostwald color system. The space outside of the color wheel and the corners of the card are reserved for shades and intermediates.

The container for the assortment is very novel. It is made of the new embossed white corrugated board developed by Hinde and Dauch.

A color card is pasted on the inside cover to give the key to the colors assembled in the container.

The well-known ¾-oz. desk bottle of Higgins Drawing Ink has a lusty little brother in the redesigned 10-cent size just released by the company. This bottle, as shown in the illustration, has the concave neck and shoulder which makes the larger bottle so popular with draftsmen and artists because it permits the stopper to be removed with one hand. The lines of the standard bottle designed by the industrial designer, Egmont Arens, have not been changed in designing the smaller bottle.

Higgins new 10-cent bottle was designed for the millions of children who cannot afford the 25-cent container. The new bottles are stoppered with a flat-top cork containing no quill. It is the company's belief that the majority of users of this small size will not be using drafting pens or lettering pens requiring a stopper equipped with a pen filler.

The new bottle is available in Waterproof Black only.

NEW LATHE CATALOG

The South Bend Lathe Works, South Bend, Ind., have just issued their new catalog No. 100A.

In it are illustrations and descriptions covering their new model "S" precision lathes. These lathes are obtainable as floor-leg lathes with underneath and pedestal motor drives, and countershaft belt drives; and as bench lathes with underneath and horizontal motor drives, and with countershaft belt drives.

The same type of lathe may also be obtained in the metric series.

Many types of attachments also may be obtained for these lathes. A description of these, together with the specifications for the various lathes, are also contained in the catalog.

POWER-TOOL CATALOG

Boice-Crane Co., Toledo, Ohio, have just released Catalog 41 describing their shop-tested power tools.

Of interest to all shop teachers are pages 4 and 5 which the firm has devoted to "Questions Every Saw Buyer Should Ask."

The catalog also describes the full list of saws, jointers, planers, grinders, shapers, drill presses, sanders, and lathes which the firm manufactures. There are also descriptions of accessories and equipment for turning, sanding, metal spinning, and the like. The motors which furnish the motive power for these power tools are also described.

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EQUIPMENT FOR VOCATIONAL SCHOOLS
SEE HOW MANY PROBLEMS
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Will Solve!
● This new catalog of Lyon Steel Equipment for Vocational Schools should be in your files. Once you realize its completeness . . . the range of useful equipment it contains . . . you will find yourself consulting it frequently. It will protect tools and materials . . . increase classroom capacity by better use of available floor space . . . help you solve problems relating to training methods with equipment used and approved by industry.
All equipment shown is exactly the same as that found in the most modern plants. It is built to withstand the hardest use. Yet, due to economies made possible by Lyon quantity production methods and volume sales to large industrial users, every unit in the line is moderately priced. Mail coupon today—investigate for yourself.
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NEW POTTERY CATALOG

A new catalog which includes illustrations and detailed information about the new Pereco Electric Forges and Crucibles has recently been issued by the Pereny Pottery and Equipment Co., 842 No. Pearl St., Columbus, Ohio.

This new catalog, designated as Pereco Catalog No. 41–L, explains all of the outstanding points of design, construction, and operation of the New Pereco Forges and Crucibles. In addition page 8 of the catalog is devoted to an explanation of the Pereco Custom Designing Service which makes it possible to have equipment designed and made according to individual requirements.

This catalog is free to interested teachers.

A MUCH WANTED BOOKLET

The C. F. Pease Co., 2601 W. Irving Park Rd., Chicago, Ill., announces that because of numerous requests, their booklet "How to Make Blueprints" will be again reprinted. The appearance of the new edition will be announced later.

GARRISON ADDS TO HANDICRAFT SERIES

Four new one-reel instructional films have been completed and added to Garrison Films, Inc.'s series of Handicraft Teaching Films, rounding out the 10 subjects originally scheduled. The complete list follows: (1) Elementary Manual Training; (2) Marionettes, Construction and Manipulation; (3) Elementary Bookbinding; (4) Loom Weaving; (5) Decorative Metalwork; (6) Leatherwork; (7) Toys from Odds and Ends; (8) Casting with Rubber Molds; (9) Simple Block Printing; (10) Clay Pottery.

The films were directed by Arthur Browning,

(Continued on page 26A)

Typical Factory Washroom.
Photo courtesy Norton Company
Worcester, Mass.

54" Circular Bradley Washfountain with foot-control.

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BRADLEY
WASHFOUNTAINS

Catalog 4010

(Continued from page 25A)

and produced by Garrison Films, Inc., 1600 Broadway, New York City, in cooperation with the Universal School of Handicrafts.

Garrison also announces that the entire series, now available in silent form only, will be sounded with commentary and ready in both versions effective March 10.

ASSOCIATION NEWS

(Continued from page 20A)

As a result of this meeting the county course of study in *General Drawing* was put into its final stages. The work is to be hectographed and assembled before the next meeting. The following outline was used in organizing the material: title, introduction, objectives, tools and materials, operations, problems (projects), and related subject-matter outline. This is the same outline that will be used in the remaining activities to be studied. — *John T. Bruehl, Jr.*

♦ The American Association for Adult Education will hold its meeting on May 12 to 14 at West Point, N. Y. Morse A. Cartwright, 60 E. 42nd St., New York, N. Y., is secretary of the association.

♦ At the present time, in the province of Nova Scotia, there are four study clubs of industrial-arts teachers organized and working on course construction. The Pictou-Colchester Club has Mr. Whitby as leader and Mr. Murray as secretary.

The Cape Breton Club is presided over by Mr. McNutt, Scribe; Mr. Clarke, Sydney.

The Halifax Club is presided over by A. R. Patten, chairman, and Wallace Gay, as secretary.

Mr. Wood, Windsor, convenes the Valley Teachers and Mr. Ferguson is the secretary.

The industrial-arts teachers of Nova Scotia realize the great need of having these clubs present in clear form what each is doing. The leaders of each of the clubs have the assignments or material prepared so that each session can be carefully planned and something definite accomplished.

The clubs are indeed fortunate in having E. K. Ford, the inspector and director of the Mechanic Science Schools in Nova Scotia, meet regularly with each club.

At a meeting of the Valley Club, held in Kentville on February 1, the suggestion was put forth by the Pictou-Colchester Club that the minutes of each club be sent to every member of the other three clubs. Progress is being made and it is expected that by June 30 the club members may be able to submit to the Nova Scotia Industrial-Arts Teachers Association a suggested course of study for industrial-arts or mechanic science departments for Nova Scotia.

♦ "Play to Your Audience" was the subject of an address by Arthur Fletcher, director of publications of the Newark Board of Education, at the midwinter dinner of the Industrial Arts Teachers' Association of Newark, N. J., held on Thursday evening, February 6, at the Vittoria Castle. The officers of this association for 1941 are as follows: president, Daniel E. Verniero; vice-president, Thomas V. Guidera; treasurer, Leonard C. Johnson; secretary, Howard G. Stintsman.

NEW PUBLICATIONS

Elementary Electricity and Electric Wiring

By B. Burdette Burling and Arthur M. Karweik. Paper, 96 pages, 8¼ by 10¾, illustrated. Price, 96 cents. Published by The Bruce Publishing Co., Milwaukee, Wis.

An industrial-arts course in electricity for the upper grades of the junior high school, for tech high schools, trade schools, and evening classes.

The authors have aimed to crowd a maximum of motivation, thorough understanding of both the *why* and the *how*, a knowledge of principles and terms, and the acquisition of a degree of skill in handling low-voltage circuits, and electrical devices and equipment.

The contents cover a study of the common uses of electricity and magnetism. The explanatory material is copiously interspersed with experiments, shop assignments, review tests, and thought questions for discussions.

Industrial-Arts Teacher Education

By Verne C. Fryklund. Paper, 112 pages, 5¼ by 7⅝, illustrated. Price, 65 cents. Published by McKnight & McKnight, Bloomington, Ill.

This study was undertaken by the Committee on Research of the National Association of Industrial Teacher Trainers, affiliated with A.V.A. This committee consists of F. Theodore Struck, Verne C. Fryklund, and David F. Jackey.

The study investigated the teacher-trainer institutions of this country, their faculties, their aims and offerings, and how directed teaching experiences are offered at these various institutions.

The study is replete with graphs and tables and bespeaks the amount of labor freely contributed by the members of the committee.

The Use and Production of Sound and Silent Filmslides: Miniature Slides and Microfilms in Schools

By Orlin D. Trapp, Waukegan Township Secondary Schools, Waukegan, Ill. Microfilm. Price, $1.63. Published by American Documentation Institute, Document No. 1429, Offices of Science Service, 2101 Constitution Ave., Washington, D. C.

This is a compendium of information for teachers who are interested in making and using filmslides in various forms. It can serve as an aid to consumer education in this field, because it is based on the judgment of technical experts in the teaching profession. Recommendations are made for equipment and accessories needed to prepare filmslides or copies of teaching aids on film strip. Brand names and prices are given. Gives also sources of commercially made film

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Address: Department of Industrial Education, Oregon State College
Corvallis, Oregon

Authorized by State Board of Higher Education.

strips and slides. The use of color photography and sound accompaniments to filmslides, two of the newest and least known developments — are simply and concretely described. The report was prepared as a graduate study at Northwestern University under the direction of Dr. Eugene S. Lawler.

Future Craftsmen of America

Sixty-nine pages, 8¾ by 11, mimeographed. Price, 65 cents. Obtainable from Mu Sigma Pi Fraternity, Wayne University, Detroit, Mich.

This yearbook of the Mu Sigma Pi Fraternity gives a fine overview of the Future Craftsmen of America movement. The fraternity is greatly interested in this student's organization because some of Mu Sigma Pi's members were instrumental in founding the movement and others are sponsors of local chapters of the Future Craftsmen of America.

The yearbook explicitly goes into the history of the movement, scope of the organization, typical organizations, the manual, degree requirements, suggested activities, and the value of this work. The yearbook also has an appendix which gives the national constitution, application for a local chapter charter, typical local chapter ritual, initiation ritual, and a list of vendors for banners, emblems and insignia, contest rules, and a typical local chapter constitution.

Designs for Carved Leather

By Louise C. Hoefer. Paper, 22 pages, 8½ by 11, illustrated. Published by Louise C. Hoefer, Glendale, Calif.

These plates, besides containing excellent full-size designs which are ready for copying, contains explanatory material on the kind of leather to be used, how it is to be prepared, what tools to use, and how to proceed with the job.

Training Procedure

By Frank Cushman. Cloth, 230 pages, 5 by 7½. Price, $2. Published by John Wiley & Sons, Inc.

This book is directed specifically to the task of improvement in the performance of work in industrial, business, or public service organizations. It differs from the author's previously written, widely known book entitled *Foremanship and Supervision* in that the latter focuses directly and extensively on the many aspects of training given through the conference technique, whereas the present book deals with the wider problem of developing training programs for personnel in industrial, business, and public service groups.

The author comes to the point directly and forcefully by pointing out that training costs are inescapable; they may be ignored but not avoided. He calls attention to 12 typical mistakes or misconceptions that all too frequently interfere with sound and effective instruction.

As an aid to executives and supervisory personnel to identify specific needs in their organization in order to meet these needs effectively, Mr. Cushman has discussed a number of typical situations — such as defective work, too many accidents, high turnover, and high costs — that can be helped through training programs.

Specific examples are given of five essential steps in the organization of suitable training. These steps include the definition of training objectives, making analyses to identify training content, outlining units of instruction based on such analyses, selecting suitable instructors, and selecting appropriate types of organization for the effective operation of the program. Sixteen commonly used training methods and devices are identified and discussed.

A chapter entitled "Checking the Outcomes of the Training Program" is intended largely for executives and others having direct responsibilities for the operation of training programs. In this chapter attention is called to important factors that need to be considered in checking and evaluating the outcomes of such training as is given.

The author has not overlooked the fact that there may be a gap between training and its effective application on the job. To this end the book includes a group of well-selected, practical suggestions as to what is to be avoided and what can be done to implement or make effective the training that is given.

To organize training programs when needed is commendable; to maintain them is of even greater importance in these fast-moving days when speed, thoroughness, and efficiency are absolutely essential. The author has appropriately stressed the ways and means of giving permanence to training programs.

In the judgment of the reviewer, this book is distinctly outstanding in its field. It is basically sound and clearly reflects firsthand, extensive, expert knowledge of training procedures. — *F. Theodore Struck.*

General Shop Woodworking

By V. C. Fryklund & A. J. La Berge. Paper, 150 pages, 7¾ by 10¼, illustrated. Price, 80 cents. Published by McKnight & McKnight, Bloomington, Ill.

A revised edition of this text for the beginner in woodwork. The material in the book is arranged to give the student a thorough knowledge of what he should be able to do and what he should know.

Under "What You Should Be Able to Do" are outlined and explained the various hand-tool operations and simple processes found in woodworking. Under "What You Should Know" planning the work, reading the working drawing, making out a bill of material, and calculating costs are explained. This section also contains considerable related material.

The book also contains a number of suggested projects, and a list of selected references for the shop library.

NEWS NOTES

♦ A local Board of Vocational and Adult Education for the City of Rice Lake, Wis., was recently appointed by the general board of education. At its organization meeting, Art E. Berg, employer member, was elected chairman, and J. H. Murphy, ex officio member, was elected secre-

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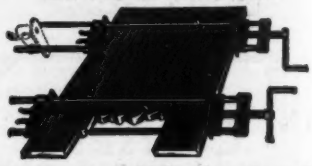

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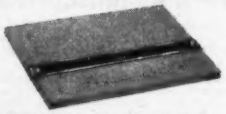

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(Continued from page 29A)

tary. Other members are Lyle Webster, employer member; W. E. Luell, employee member; Ralph Young, employer member. An appropriation of $5,000 in local tax levy has been granted the board by the city council. A director will be employed and a school established shortly.

♦ An examination for the positions of supervisor and assistant supervisor of Indian education in mural painting and fine arts has been announced by the United States Civil Service Commission. Artists are sought for the Indian Field Service who will guide the development of new techniques for the expression of old Indian artistic skills and who will encourage perpetuation of the fundamental art forms of the Indian.

Field supervisors of mural painting and fine arts, at a salary of $3,800 a year, will direct the art work in Indian schools of the United States and personally teach mural, easel, and stage scenery techniques. They will be responsible for in-service training programs for art teachers and for the arrangement of exhibits of Indian art. Securing contracts for mural work by Indian painters and supervising the execution of the murals is also included in the duties. Assistant supervisors will receive a salary of $2,300 a year and will have responsibility for the art activities in Indian boarding and day schools on reservations. They too will experiment with new techniques in the use of native materials. The salaries are subject to a retirement deduction of 3½ per cent.

Applications must be filed at the commission's Washington office not later than March 31, 1941. Further information and application forms may be obtained from the secretary of the Board of U. S. Civil Service Examiners at any first- or second-class post office, or from the U. S. Civil Service Commission, Washington, D. C.

♦ Wallace C. Cumming, director of vocational education in the Omaha, Neb., public schools, has been informed that the Glenn L. Martin plant at the Fort Crook plant will consider for employment all graduates of vocational metal-trades courses in Omaha high schools. It is expected that the school-shop equipment will be used on a 24-hour basis, giving the high school pupils access to the machinery through the day, the "refresher course" students using it through the night.

♦ Considerable thought and study are being given to the possibility of extending the vocational work in Maine Township High School at Des Plaines, Ill., in order to take care of about 60 per cent of the students who do not go to college. In order to extend the program in industrial arts it would require an expenditure of from $40,000 to $50,000 which would include a new shop building.

♦ In recognition of the importance of youth in the development of the national aviation program, scholarships for training in aviation will be awarded to three young men who show outstanding promise of achievement in this field.

These Air Youth Scholarships are offered at the Boeing School of Aeronautics, Oakland, Calif., the Casey Jones School of Aeronautics, Newark, N. J., and the Spartan School of Aeronautics, Tulsa, Okla.

Any young man who is an American citizen and has demonstrated an interest and aptitude for aviation training may enter the competition.

Candidates must be ready to graduate from high school, or a recognized private school by June, 1941, or have graduated from these schools within the past three years.

To enter the competition, write for an application blank to: Scholarship Awards Committee, Air Youth of America, 30 Rockefeller Plaza, New York City.

♦ The board of education at Kansas City, Mo., has asked for enough equipment to train 250 men in sheet-metal work, and an additional 250 in welding.

♦ The Chicopee, Mass., public school system has recently disclosed that the demand for training in the skilled mechanical trades exceeds the accommodation by over 150 per cent. All grad-department have been placed.

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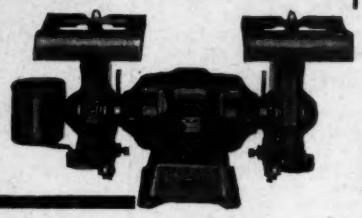

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